BLM LIBRARY
88068149

White Pine Power Project

ECOLOGICAL RESOURCES BASELINE

TECHNICAL REPORT

QH
75
.T434
1983b

#902816924

ID88068149

QH
75
.T434
1983b

ECOLOGICAL RESOURCES BASELINE REPORT

Technical Report
For The
WHITE PINE POWER PROJECT

Prepared By
DAMES & MOORE

October 1983

SUMMARY

The White Pine Power Project (WPPP) is a proposed 1500 megawatt coal-fueled, steam-electric generating facility to be located in White Pine County, Nevada. In addition to the power generation system, the Project consists of a power transmission system, a water supply system, and a coal transportation system. As currently proposed, WPPP will be jointly owned by White Pine County and two private utilities. Project participants include eight Nevada entities and six California municipalities.

The preferred site for the WPPP Generating Station is the North Steptoe Valley Site. The Butte Valley Site and the Spring Valley Site are feasible alternatives to the preferred site. The water supply system for each site includes well fields located within the same valley except for the Butte Valley Site which will require additional well fields in Steptoe Valley. The preferred power transmission system for each site includes two new transmission lines terminating in Southern Nevada and one new transmission line terminating in or near White Pine County. The preferred coal transportation system includes a new and upgraded railroad from the site to existing railroads in northern Nevada. An alternate system includes a new railroad from the site to an existing railroad in Southern Nevada.

This technical report, which includes baseline material for the WPPP Environmental Impact Statement (EIS), presents the results of field and literature studies. The technical report is intended to be a background document providing details of information summarized in the EIS. It also provides the basis for determining environmental impacts and mitigative measures.

This technical report presents baseline data on ecological resources using four basic ecosystem components: 1) soils; 2) vegetation; 3) terrestrial wildlife; and 4) aquatic ecology. A separate section on threatened and endangered species is also provided.

The soils of White Pine County are predominantly of the northern, or cool desert within the Calcareous Mountains section of the Great Basin Division of the Intermountain Region of Nevada. Soils associated with the WPPP sites and corridors within White Pine County have good, moderate, and poor reclamation potential. Transmission line and rail corridors extending south of White Pine County intersect Major Land Resource Areas (MLRA) 28, 29 and 30, while rail corridors extending north of White Pine County cross MLRA 28.

Major vegetation units in White Pine County include: Salt Desert and Transitional Desert Zone of shadscale and black greasewood; Northern Desert Shrub Zone primarily of sagebrush; Pinyon-juniper Woodland Zone which also includes a mountain brush formation of mountain mahogany; Mixed Coniferous Forest Zone; and Alpine Tundra. Ecologically and economically important plant species occurring on or near the WPPP sites and corridors include species important as forage (grasses, and many shrubs and forbs) and species that have the potential to cause economic loss or injury to livestock. Unique species on or near the WPPP sites and corridors include swamp cedar (an ecotype of Rocky Mountain juniper) and pygmy sagebrush. Plant species under review by the U.S. Fish & Wildlife Service for listing as threatened or endangered and having sufficient information to support a listing are the oneleaf Torrey milkvetch, Monte Neva paintbrush, bicolored penstemon and Great Basin fishhook cactus.

Terrestrial habitat types in White Pine County include shrub-steppe habitat in the valley bottoms, pinyon-juniper habitat on mountain ridges, wetlands that occur in valley bottoms, and coniferous forest that occur above 8000 feet. Also, desert shrub habitat occurs in Clark County. Important terrestrial wildlife species include game species, species of special concern, species listed by the State of Nevada or under review by the U.S. Fish & Wildlife Service for listing as threatened or endangered, and federally listed threatened or endangered species. The bald eagle and peregrine falcon are the only federally listed threatened or endangered species that occur on or near the WPPP area sites and corridors.

Aquatic habitats on or near the WPPP sites and corridors consist primarily of small streams, small reservoirs, and cool to warm springs. Most streams originate in the mountains adjacent to the valleys and, during the arid seasons, terminate before reaching the alluvial valley floors. Springs occur adjacent to the mountains and their flow usually terminates within a short distance of the spring head. Small reservoirs include Comins Lake and Bassett Lake in White Pine County. The aquatic habitat supports eleven species of special concern (species listed by the State of Nevada or presently under review by the U.S. Fish & Wildlife Service for listing as threatened or endangered), game fish species and on federally listed endangered fish species, the Pahrump killifish.

TABLE OF CONTENTS

Page

SUMMARY i

TABLE OF CONTENTS iv

LIST OF TABLES viii

LIST OF FIGURES ix

CHAPTER 1 - INTRODUCTION 1-1

CHAPTER 2 - METHODOLOGY 2-1

- 2.1 SOILS 2-1
- 2.2 VEGETATION 2-1
- 2.3 TERRESTRIAL WILDLIFE 2-2
    - 2.3.1 Agency Files 2-3
    - 2.3.2 Field Reconnaissance 2-3
        - 2.3.2.1 Aerial Reconnaissance 2-4
        - 2.3.2.2 Ground Reconnaissance 2-4
- 2.4 AQUATIC ECOLOGY 2-5

CHAPTER 3 - REGIONAL SETTING 3-1

- 3.1 SOILS 3-1
- 3.2 VEGETATION 3-2
    - 3.2.1 Major Vegetation Units 3-2
    - 3.2.2 Important Species 3-5
- 3.3 TERRESTRIAL WILDLIFE 3-7
    - 3.3.1 Habitats 3-7
    - 3.3.2 Important Species 3-8
- 3.4 AQUATIC ECOLOGY 3-12
    - 3.4.1 Habitats 3-12
    - 3.4.2 Important Species 3-13

TABLE OF CONTENTS (continued)

Page

CHAPTER 4 - POWER GENERATION SYSTEM 4-1

4.1 BUTTE VALLEY SITE 4-1

4.1.1 Soils 4-1
4.1.2 Vegetation 4-2
4.1.3 Terrestrial Wildlife 4-4
4.1.4 Aquatic Ecology 4-4

4.2 NORTH STEPTOE VALLEY SITE 4-4

4.2.1 Soils 4-4
4.2.2 Vegetation 4-5
4.2.3 Terrestrial Wildlife 4-8
4.2.4 Aquatic Ecology 4-8

4.3 SPRING VALLEY SITE 4-9

4.3.1 Soils 4-9
4.3.2 Vegetation 4-9
4.3.3 Terrestrial Wildlife 4-11
4.3.4 Aquatic Ecology 4-11

CHAPTER 5 - WATER SUPPLY SYSTEM 5-1

5.1 BUTTE VALLEY SITE WELL FIELDS AND PIPELINE CORRIDORS 5-1

5.1.1 Soils 5-1
5.1.2 Vegetation 5-1
5.1.3 Terrestrial Wildlife 5-2
5.1.4 Aquatic Ecology 5-2

5.2 NORTH STEPTOE VALLEY SITE WELL FIELDS AND PIPELINE CORRIDORS 5-3

5.2.1 Soils 5-3
5.2.2 Vegetation 5-4
5.2.3 Terrestrial Wildlife 5-4
5.2.4 Aquatic Ecology 5-5

5.3 SPRING VALLEY SITE WELL FIELDS AND PIPELINE CORRIDORS 5-5

5.3.1 Soils 5-5
5.3.2 Vegetation 5-6
5.3.3 Terrestrial Wildlife 5-7
5.3.4 Aquatic Ecology 5-7

TABLE OF CONTENTS (continued)

Page

8.3.2.10 Meadow Valley Wash Speckled Dace 8-10
8.3.2.11 Big Springs Spinedace 8-10

CHAPTER 9 - REFERENCES 9-1

CHAPTER 10 - GLOSSARY

APPENDIX A - Soil Properties

APPENDIX B - Plant Species in the WPPP Region

APPENDIX C - Terrestrial Wildlife Species in the WPPP Region

APPENDIX E - Aquatic Species in the WPPP Region

LIST OF TABLES

Table	Title
2-1	Aerial and Ground Reconnaissance Schedule
3-1	Soils Classification
3-2	Noxious and Injurious Weeds
3-3	Relict Dace Habitat
3-4	Aquatic Species and Habitats
4-1	Dominant Soil Properties
4-2	Soils and Ecological Sites White Pine County
4-3	Site Acreage
8-1	Candidate Threatened and Endangered Plant Species

LIST OF FIGURES

Figure	Title
1-1	Generating Station Sites Power Generation System
3-1	Soils White Pine County
3-2	Major Vegetation Zones
3-3	Vegetation White Pine County
3-4	Terrestrial Wildlife White Pine County
3-5	Distribution of Relict Dace Habitat
3-6	Distribution of Desert Fish Species White River Valley
3-7	Distribution of Desert Fish Species
4-1	Soils and Ecological Sites Butte Valley Site
4-2	Soils and Ecological Sites North Steptoe Valley Site
4-3	Soils and Ecological Sites Spring Valley Site
5-1	Water Supply System Butte Valley Site
5-2	Water Supply System North Steptoe Valley Site
5-3	Water Supply System Spring Valley Site
6-1	Power Transmission System
7-1	Coal Transportation System

1.0 INTRODUCTION

The construction and operation of the White Pine Power Project (WPPP) will result in altered land utilization. These changes could impact existing ecological resources. This technical report describes the existing ecological resources on or near WPPP sites and corridors (the WPPP area). This information is summarized in the WPPP Environmental Impact Statement.

The ecology of the WPPP area is described using four basic ecosystem components: soils, vegetation, terrestrial wildlife and aquatic ecology. The WPPP area consists primarily of White Pine County (the County) in which the three power generation system sites and water supply system well fields and pipeline corridors are located. The sites are located in Butte Valley, North Steptoe Valley and Spring Valley. Power transmission system and coal transportation system corridors extend south of White Pine County through portions of Nye County, Lincoln County, and Clark County. Also potential coal transportation system corriodors extend north from White Pine County into Elko County. The locations of the sites are shown on Figure 1-1.

Information to describe the salient characteristics of each ecological component was obtained through a literature review including government agency information and field observations. Quantitative data were collected primarily in the vicinity of the power generation system sites where the intensive impacts of WPPP would occur. However, areas of sensitive species or sensitive issues outside the sites were also investigated. Chapter 2 of this report describes the methodology used to obtain the baseline data for each ecosystem component. Chapter 3 provides an overview of the

WPPP area and is followed by four chapters which describe the ecosystem components of the sites, water supply system well fields and pipeline corridors, power transmission system corridors, and coal transportation system corridors. Chapter 8 provides a synopsis of species within the WPPP area which are either federally listed as threatened or endangered or are being reviewed by the U.S. Fish & Wildlife Service (USFWS) to be considered for possible listing.

2.0 METHODOLOGY

The ecological resources of the WPPP area were described by both literature and information review and field data collection for soils, vegetation, terrestrial wildlife and aquatic biota. Field data were acquired primarily in the vicinity of the three WPPP sites, although this varies somewhat among disciplines. Specific data collection methods for each ecological discipline are provided in the following sections.

2.1 SOILS

Major soils of the three sites were inspected during field reconnaissance by the Soil Conservation Service (SCS), Bureau of Land Management (BLM) and Dames & Moore. Recent soil surveys of the sites were conducted by the SCS for the BLM. These Third Order soil maps, at a scale of 1:24,000, provide semi-detailed information for each of the sites.

A reconnaissance level soil survey at a scale of 1:250,000 prepared by the SCS for broad, generalized, land use and development planning was used to obtain soils data within the County. Soils information for the WPPP transmission line and railroad corridors outside the County was obtained from the National Atlas (U.S. Geological Survey, 1970) which provides large-scale soils information.

2.2 VEGETATION

The vegetation of the three sites and associated water supply system is described using literature, BLM and SCS data, and field surveys. Areas traversed by the power transmission system and coal transportation system are described primarily from literature, although qualitative observations

of major vegetation associations for areas near the three sites were made during field reconnaissance.

The SCS has, in conjunction with soil surveys, delineated ecological sites with potential species composition and annual production. The BLM has conducted range surveys over part of the area, which define species composition and range condition. These data were supplemented by estimates of species foliar cover using line intercepts in plots representing structurally homogeneous vegetation units (communities) representing ecological sites. Sampling in each plot consisted of establishing a central point from which three to four 50-foot transect lines were randomly located. (Four lines were used where the flora was relatively diverse.) Foliar cover was estimated by measuring the amount occupied by each species. Mean cover was calculated for each species using values from all transects of a plot.

Other observations were made to characterize the plant community, and included slope, aspect, moisture regime, erosion evidence including vehicle disturbance, browsing, grazing, and general life form (e.g., forb, grass, and shrub) of the vegetation.

The potential for listed and candidate threatened or endangered plant species and critical habitat to occur on or near the WPPP area was determined by literature review. Both federally and state-listed species were considered. The habitat occurrence of such species was identified during the field surveys. Habitats so identified were then searched for the species in question.

2.3 TERRESTRIAL WILDLIFE

Wildlife populations and their distribution in the WPPP area are described using the following data sources:

a. Published literature.

b. Files of the Nevada Department of Wildlife (NDOW) and the BLM.

c. Discussions with NDOW and BLM personnel.

d. Field reconnaissance of the three sites, well fields, water pipeline corridors, and transmission line corridors within the County.

2.3.1 Agency Files

The NDOW information included mapped seasonal distributions of pronghorn, mule deer, elk, and sage grouse for the County. NDOW provided several reports on bighorn sheep distribution and population trends.

The BLM provided reports and maps of sage grouse lek and raptor nest locations. The sage grouse data included the legal description of each sage grouse lek, the number of males observed at each lek and whether the lek was currently active. The raptor data included the legal description of each raptor nest, whether a nest was currently active, and the number of years it was known to be active. BLM also provided records of bald eagle sightings during the winters of 1980 to 1982.

2.3.2 Field Reconnaissance

The purpose of the field reconnaissance was to field-truth information obtained from other sources. Additional observations of wildlife and habitat were recorded during the surveys and reported to NDOW and BLM.

Field reconnaissance was performed during two seasons; early spring (late April 1982) and early summer (late June 1981), and included aerial and ground reconnaissance (Table 2-1).

2.3.2.1 Aerial Reconnaissance

Aerial reconnaissance was performed from a helicopter flying at a speed of 50 to 60 miles per hour and an altitude of approximately 50 feet. Two observers were present on each flight. (Observers for the 23 April 1982 flight were Mr. Larry Gilbertson of NDOW, Ely, and Dr. Peter Davis of Dames & Moore. On the 24 and 25 April 1982 flights, the observers were Mr. Mike Perkins of BLM, Ely, and Dr. Davis.) All flights started as soon as there was sufficient daylight (approximately 4:30 a.m., PST), and lasted approximately three hours.

All aerial surveys began at the Gonder Substation and followed the original transmission line corridors to the generation station site. North-south transects approximately 0.5 mile were then flown over the site specifically to locate sage grouse leks. Following this, pipeline corridors and well fields were surveyed as time and fuel supply permitted. Wetlands southwest of the North Steptoe Valley Site and north of the Spring Valley Site were specifically surveyed to determine use by waterfowl and shorebirds. Other wildlife observed during the flights were recorded.

2.3.2.2 Ground Reconnaissance

An early spring (23, 24 and 25 April 1982) general reconnaissance was conducted of the three sites and locations of lineal facilities. All observations of wildlife or their signs (e.g., fecal pellet groups, burrows and tracks) were

recorded. Known lek locations were searched for signs of use, and other areas which appeared as potential lek locations were surveyed. These ground surveys commenced at first light by driving slowly along roads on or near areas that would be affected by WPPP activities. Periodic stops were made to listen for sage grouse "booming" (a noise made by male sage grouse during their mating displays on a lek). Booming was used to pinpoint lek location. General reconnaissance was performed following the search for the lek sites to note the location and size of habitat types.

The primary purpose of the early summer (19, 20, 22 June 1981) ground surveys was to determine the relative diversity and productivity of habitats on the three WPPP sites. All birds observed were recorded while slowly walking a transect which crossed all habitat types. The number of bird species present is related to diversity of the site, and the total number of birds seen per unit time provides an index to relative productivity. An index to big game use of the three sites was obtained by counting fecal pellet groups in twenty 0.01-acre circular plots spaced approximately 150 feet apart. A general reconnaissance of each site was also performed during the early summer field reconnaissance. All observations of wildlife or their signs were again recorded during this sampling.

2.4 AQUATIC ECOLOGY

Published and unpublished literature was reviewed and state and federal regulatory agency personnel were contacted to obtain background knowledge of aquatic ecology in the WPPP area. After items of concern were identified, a site reconnaissance and qualitative field sampling program was initiated to field-truth habitats known or suspected to be inhabited by important or threatened and endangered aquatic

species. BLM or NDOW personnel were in attendance during the site reconnaissance and field sampling. Field sampling was performed on springs in the vicinity of the Cardano Ranch in northern Steptoe Valley along the base of the Cherry Creek Range. Specific locations visited during the site reconnaissance included the Shoshone ponds in Spring Valley and Lookout Springs in Antelope Valley. Becky Springs, Goshute Creek, Cardano Ranch Springs, Comins Lake, Bassett Lake and Duck Creek were inspected in Steptoe Valley.

3.0 REGIONAL SETTING

The principal climatic features of the County include average annual precipitation of less than 12 inches, average annual temperatures of 45° to 50°F (average annual temperature at Ely is 44°F) and a frost-free period of 85 to 165 days (SCS, 1964). The average annual precipitation for the City of Ely is 8.7 inches with the 40-year range between 14.7 inches in 1967 to 4.6 inches in 1942 (National Oceanic and Atmospheric Administration, 1979).

The County is part of the Great Basin Physiographic Province of the Intermountain Region (Cronquist, et al., 1972). This physiographic province is characterized by north-south oriented mountain ranges separated by nearly level valleys. Elevation ranges from approximately 6000 feet in the valleys to 11,000 feet in the mountain ranges.

3.1 SOILS

The soils of the County are within the Basin and Range Province with isolated mountain ranges separated by aggraded desert plains, or basins. The basins are deep, alluvium-filled structural depressions (Peterson, et al., 1981).

Parent materials from which the basin soils originated include the weathered limestone, quartzite, granite, and other rocks of the ranges contributing to the alluvium fill material. Soils of the mountains and foothills have formed largely from residual sedimentary and igneous rocks.

The soils of the County are predominantly of the northern, or cool desert (Odum, 1971) within the Calcareous Mountains Section of the Great Basin Division of the Intermountain Region in Nevada (Cronquist, et al., 1972).

The Sierozems, Calcisols and Alluvial soils of Arid Regions mapped for The Soils of the Western United States (SCS, 1964), are classified today as Aridisols, Entisols, and Inceptisols (SCS, 1975). These soils are extensive and Nevada's 7,530,000 acres make up 56 percent of similar soils in the western U.S. (SCS, 1964). Soils of the WPPP area are classified in accordance with U.S. Standard Soil Taxonomy (SCS, 1975) and are listed in Table 3-1. The distribution of soils within the County is shown on Figure 3-1. (Soil properties are discussed in detail in Appendix A.)

3.2 VEGETATION

3.2.1 Major Vegetation Units

Oosting (1956) described the vegetation of eastern Nevada as the Northern Desert Shrub Biome of the Cold Desert Formation. Kuchler (1975) more simply mapped the area as Great Basin Sagebrush and Great Basin Pine Forest. Similarly, Cronquist, et al.(1972) classified the intermountain valleys as the Sagebrush Zone, with a Pinyon-juniper Zone occurring on the bordering ranges. A Shadscale Zone is mapped (Kuchler, 1975) for areas south of White Pine County, although shadscale is acknowledged in saline valley bottoms further north (Cronquist, et al., 1972). A similar sequence of vegetation is described by the SCS (1977), but their Northern Desert Shrub and Salt Desert-Transitional Desert Shrub classes are a finer division of vegetation units. Figure 3-2 shows the major vegetation zones characteristic of the region. Figure 3-3 shows the distribution of vegetation in the County. Small areas of wetlands, composed mainly of cattails, rushes, black greasewood and inland saltgrass occur within the Salt Desert Complex. Cowardin, et al. (1979) classify such wetlands as a seasonally and intermittently flooded palustrine system of emergent plant species. Although many of the lower valley

communities intergrade, elevational zones are distinguishable in most areas and are used to discuss general vegetation patterns.

The Salt Desert Shrub occurs on somewhat saline valley soils, and where precipitation is generally less than seven inches. The vegetation is characteristically open, some times covering only ten percent of the ground (Peterson, et al., 1981). The zone is characterized by shadscale associations, but black greasewood, bud sagebrush, Gardner saltbush, low rabbitbrush or Douglas rabbitbrush, spiny hopsage, and winterfat-dominated communities are also common (Oosting, 1956). (Common and scientific names of plant species are listed in Appendix B.)

Inclusions of nearly pure stands of winterfat are characteristic of the Salt Desert Shrub Zone on silty soils (Cronquist, et al., 1972; SCS, 1981). This vegetation is often heavily grazed with a resulting increase of low rabbitbrush, broom snakeweed, and saltbush. Continued disturbance will result in halogeton invasion and dominance (SCS, 1977).

The Sagebrush Zone occupies an altitudinal belt from about 5000 to 8500 feet and is best developed on deep, permeable salt-free soils (Cronquist, et al., 1972). Big sagebrush is the dominant species although a number of other plants occur as associates, including low sagebrush, black sagebrush, rubber rabbitbrush, and littleleaf horse-brush. Cronquist, et al. (1972) also list a number of associated grass and herbaceous species. The sagebrush complex of the Great Basin is composed of numerous closely related species and ecotypes. According to Beetle (1978), the Tridentatae Section includes five types that occur in the County and are representative of the following soil conditions:

- Black sagebrush - shallow soils
- Alkali sagebrush - tight soils
- Stiff sagebrush - scab lands
- Basin big sagebrush - recent alluvium of some depth
- Low sagebrush - glacial tills

Woodland and forested vegetation occurs on the mountain slopes above about 6500 feet elevation (SCS, 1977). The Pinyon-juniper Woodland Zone occupies the lower elevations within the forest or wooded vegetation to about 8500 feet (Billings, 1951). Singleleaf pinyon and Utah juniper are in abundance, and woodland character varies with elevation, soil conditions and available soil moisture (Cronquist, et al., 1972). Co-dominant trees are singleleaf pinyon and Utah juniper (Cronquist, et al., 1972). Rocky Mountain juniper occurs along streams and dry washes, and an ecotype called swamp cedar by Billings (1954), forms open stands in moist saline valley floors in Spring Valley (Odum, 1971). Big sagebrush, serviceberry, antelope bitterbrush, rabbitbrush species and various other shrubs, grasses, and forbs comprise the understory vegetation. Mountain shrub vegetation of curlleaf mountain mahogany intermingles with pinyon-juniper woodland at the upper elevations (7000 feet) and, although transitional, is recognized as a distinct zone in the County (SCS, 1977). This vegetation type may be successional to coniferous forest, but is affiliated with granitic and limestone-derived soils.

The Montane Zone is usually characterized by ponderosa pine and Douglas fir. However, the County is near the edge of ponderosa pine range and therefore white fir and limber pine combine to form a Mixed Conifer Zone above about 8000 feet (SCS, 1977). Other characteristic species include Douglas fir and aspen, which occur primarily along stream courses and seeps, and isolated pockets of Engelmann spruce,

which is associated with moist north-exposed sites. Ponderosa pine is scattered throughout the Snake Range and Schell Range and is rare to nonexistent in the Egan Range and White Pine Range, respectively (SCS, 1977).

Bristlecone pine occurs predominantly above about 8500 feet and, along with limber pine and whitebark pine, forms ridge-top forests and characteristic shrub-like krummholz near timberline (Odum, 1971).

Alpine tundra occurs on the Schell Creek Range above about 11,000 feet elevation (Cronquist, et al., 1972; SCS, 1977). Timberline on the Egan Range is due to fire, landslides and factors other than climate (SCS, 1977), thus a true alpine tundra is absent.

Areas south of the County become increasingly arid and warm. As a result, Great Basin shrub vegetation is gradually replaced by elements of the Mojave Desert (Cronquist, et al., 1972; Henningson, Durham & Richardson, 1980). This gradient is reflected primarily by the dominance of creosote bush which becomes more prevalent south of the Clark County line. A number of different creosote bush communities have been recognized, with the creosote bush-wolfberry-spiny hopsage association the most common in southern Nevada (Billings, 1954). Groves of Joshua trees extend further north and to higher elevations into the Shadscale and Sagebrush Zones (Cronquist, et al., 1972).

Blackbrush also is present at the northern extreme of the Creosote Bush Zone. Cronquist, et al.(1972) characterize the blackbrush community as transitional between creosote bush and shadscale communities. Black-brush is associated with nonsaline, sandy soils where annual rainfall is often below six inches.

3.2.2 Important species

A number of plant species that could occur in the WPPP area are recognized by the State of Nevada as threatened or endangered, and some of these are candidates for listing by USFWS. Species in these categories are discussed in Chapter 8. Other species have been recognized as unique in the County and include swamp cedar, which is an ecotype of Rocky Mountain juniper, and pygmy sagebrush.

Swamp cedar occurs in eastern Spring Valley, forming scattered woodlands at relatively low elevations reflecting near-surface groundwater. Such woodlands are considered a unique habitat, and are presently under consideration for designation as a Research Natural Area.

Pygmy sagebrush is primarily associated with sandy soils and is especially dominant on inset fans above the floor of Spring Valley. A 160-acre Shoshone Pygmy Sagebrush Natural Area was established on the east side of Spring Valley in the early 1970s (Hardy, 1981). It was recently recommended that the area be reduced to 40 acres and secondly, that it be considered as a Research Natural Area. No decision has been made to date on this latest designation (Lindsey, 1983).

Numerous plant species of the WPPP area are important ecologically and economically. Many grass species that occur, or have the potential to occur as components of the plant communities are used for livestock grazing and by wildlife. Examples of these species are Indian ricegrass, needle-and-thread, Sandberg bluegrass, alkali sacaton, bluebunch wheatgrass, creeping wildrye, galleta, sand dropseed and western wheatgrass. Shrub species are more prominent and provide forage for sheep, and food and cover for wildlife species. Major shrubs include sagebrush species, shadscale,

winterfat, fourwing saltbush, antelope bitterbrush, blackbrush, serviceberry, rabbitbrush, mountain mahogany and black greasewood.

Several plant species in the County also have the potential to cause economic loss or injury. For purposes of control, they are recognized as noxious or injurious weeds by Nevada Revised Statutes 555.130 to 555.200. Such plant species that occur, or have potential to occur in the WPPP area are listed on Table 3-2. Of these, halogeton and Russian thistle are prominent invaders on disturbed areas and occur on the three sites.

3.3 TERRESTRIAL WILDLIFE

3.3.1 Habitats

Four wildlife habitat types that occur in the County and an additional habitat type in Clark County are likely to be affected by WPPP activities. The valley bottoms contain a shrub-steppe habitat (big sagebrush, black greasewood, rubber rabbitbrush and shadscale communities) and provide habitat for black-tailed jackrabbit, pronghorn (antelope), horned lark, sage sparrow, brewer's sparrow, sage thrasher, western fence lizard and western rattlesnake. The distribution of terrestrial wildlife in the County is shown on Figure 3-4. (Common and scientific names of terrestrial wildlife species are listed in Appendix C.)

Shrub-steppe habitats also occur at higher elevations, on benches at the base of mountains, and are dominated primarily by big sagebrush. Fingers of pinyon-juniper woodland extend downward from adjacent ridges into these areas. Animal species typical of the pinyon-juniper habitat include mule deer, mountain bluebird, ferruginous hawk, and scrub jay.

Wetlands are the third major habitat type and occur in valley bottoms. Wetlands are dominated by cattails and assorted saltgrasses, rushes and sedges and provide staging areas and breeding habitat for many species of waterfowl and shorebirds. Species common to wetland habitat are sandhill crane, long-billed curlew, snowy egret, American avocet, mallard, cinnamon teal, eared grebe, muskrat and leopard frog. Although limited in area, wetlands are an important ecosystem, which increase the biological diversity of the area. Additionally, wetlands are protected by Section 404 of the Clean Water Act of 1972 (P.L. 92-500) as amended in 1977 (33 U.S.C. 466 et seq.) and Executive Order 11990. Wetland areas that occur within the three sites are discussed under the appropriate range site (e.g., Saline Bottom and Saline Meadow).

The fourth habitat type is coniferous forest which occurs above 8500 feet and is dominated primarily by white fir and limber pine pine (Section 3.2.1). Animals which use coniferous forest include Stellar's jay, pine siskin and gray-headed junco.

Desert shrub habitat becomes prominent south of the Clark County line (Section 3.2.1) and is dominated by creosote bush at lower elevations (below 4200 feet), and blackbrush at higher elevations (McQuivey, 1979). Animals associated with this habitat include bighorn sheep, desert tortoise, loggerhead shrike and vesper sparrow.

3.3.2 Important species

Bald eagles, an endangered species, are known to occur in the County, although none are thought to nest there. Peregrine falcons have also been sighted in the WPPP area. A more detailed discussion of threatened and endangered animal species is included in Chapter 8. The spotted bat,

ferruginous hawk, Swainson's hawk, white-faced ibis, long-billed curlew, gila monster and desert tortoise are presently under status review by the USFWS (U.S. Department of the Interior, 1982) and are of particular concern to the NDOW. The spotted bat is likely to reside in caves and crevices in rocky cliffs and canyons (Whitaker, et al., 1980), whereas the desert tortoise and gila monster occur outside the County primarily in southern Nevada.

Mule deer, due to recreation value, are perhaps the most important terrestrial wildlife species of the County. The size of the mule deer population in the County is limited principally by the amount of available summer range (BLM, 1982). Their summer range includes feeding areas in meadows on the edge of the pinyon-juniper habitat and resting areas near the lower edge of the coniferous forest. This winter and spring range of mule deer includes sagebrush and pinyon-juniper communities. Shrubs such as sagebrush, bitterbrush and mountain mahogany form a large part of deer diet (Kufeld, et al., 1973).

Approximately 1860 mule deer were estimated to inhabit the Cherry Creek Range and North Egan Range in 1982 while approximately 1520 and 6060 mule deer were estimated to be present in the South Snake Range and Schell Creek Range, respectively (Gilbertson, 1982). Factors limiting herd size are not well understood but mule deer herds in the Cherry Creek Range, North Egan Range, and South Snake Range are believed to be well below carrying capacity. Therefore, the size of these herds could be increased without damaging their range. Mule deer herds on the Schell Creek Range are presently near carrying capacity. No mule deer population estimates are available for the Butte Mountains because no summer populations have been identified. However, the Butte Mountains provide winter range for mule deer that summer in the nearby Ruby Mountains.

The NDOW estimates for 1982 indicate that herds of about 200 pronghorn reside in Steptoe Valley and Spring Valley. It is believed that both valleys provide enough habitat for additional pronghorn, but lack of water is presently limiting herd size (Gilbertson, 1982). Pronghorn occur primarily in the valley bottoms and on the benches at the base of the mountains. Shrubs, particularly big sagebrush, form the bulk of their diet, although they also utilize a number of forbs when available (Sundstrom, et al., 1973).

Nevada's only hunted elk population, comprised of an estimated 300 animals, occurs in the Schell Creek Range east of Ely. Ten to 15 elk permits are issued annually, with hunter success of 80 to 90 percent. The majority of these elk winter on the benches on the west side of the Schell Creek Range south of Ely in the same area as mule deer (NDOW, no date). Elk also occur in other mountain ranges in the County, but generally in small populations. Their primary food sources are grasses and forbs (Kufeld, et al., 1973).

Distribution of bighorn sheep is limited by the presence of suitable escape terrain (rough, steep slopes). Sheep are rarely found more than 0.5 mile from such terrain (McQuivey, 1979). In addition, bighorn sheep distribution in Nevada is limited by presence of water; most sheep occur within two miles of a water source. The importance of water in conjunction with good escape terrain is perhaps best exemplified by the River Mountains bighorn population. The River Mountains were originally a seasonal range used only during the cooler months of the year. However, with the addition of water sources near good escape terrain the mountains have become year-round sheep range inhabited by the most productive bighorn herd in Nevada (McQuivey and Leslie, 1976; McQuivey, 1981).

Desert bighorn sheep occupy most of the mountain ranges in the southern half of Nevada. The main habitat type of desert bighorn is desert scrub; occasionally pinyon-juniper woodland and alpine meadows are also utilized. Grasses are the major component of their diet, but shrubs are also frequently eaten (McQuivey, 1979).

Sage grouse utilize sagebrush communities in valley bottoms and on benches at the base of the mountains. Evidence suggests that most sage grouse activities are centered around the lek or strutting ground. Thus, the lek is a crucial portion of their habitat. Leks occur mainly in the WPPP area on low ridge tops in valleys near the base of the mountains with south or west exposures (NDOW, no date). Visibilty of other grouse is important during strutting, thus most leks are in areas of low sagebrush. Sage grouse habitat requirements have been reviewed in detail (Braun, et al., 1977). A variety of vegetation is included in sage grouse diet.

Scattered bands of wild horses, which are protected by the Wild Horse and Burro Act of 1971 (16 U.S.C. 1331-1340), occur in the Steptoe Valley, Spring Valley and Egan Basin and portions of Elko County, Lincoln County, and Nye County. Wild horses feed primarily on grasses and forbs.

Raptors nesting in the County include goshawk, prairie falcon, Swainson's hawk, ferruginous hawk, golden eagle, Cooper's hawk, American kestrel (sparrow hawk) and red-tailed hawk. Of these, the ferruginous hawk is the most sensitive to human encroachment and will readily abandon their nest when disturbed. In the County, most ferruginous hawks nest in juniper trees on the edge of sagebrush communities and the nests are reused each year (Perkins, 1981). Ferruginous hawks prey primarily on rodents and rabbits (Snow, 1974). The status of the ferruginous hawk is presently being reviewed by

the USFWS (U.S. Department of the Interior, 1982). In Nevada, most golden eagles nest on cliffs, whereas red-tailed hawks, Cooper's hawks and American kestrels nest in trees.

Waterfowl and shorebirds utilize wetland areas mainly during spring and fall migrations. However several species including mallard, common Canada goose, cinnamon teal, American pintail, gadwall, pied-billed grebe, American egret, and sandhill crane have been observed in the nest or with young in the area. Additional waterfowl and shorebirds in the area include blue-winged teal, green-winged teal, widgeon, shoveler, canvasback, redhead, bufflehead, lesser scaup, ruddy duck, American coot, western grebe, eared grebe, great blue heron, black crowned night heron, long-billed dowitcher, Wilson's pnalarope, American avocet, killdeer, snowy plover, and western sandpiper.

3.4 AQUATIC ECOLOGY

3.4.1 Habitats

Aquatic resources of the WPPP area consist primarily of small streams and reservoirs and cool to warm springs. Most streams originate in the mountains adjacent to the valleys and, during the arid seasons, terminate before reaching the alluvial valley floors. Therefore, aquatic stream habitat is restricted to the cooler and relatively moist mountain ranges. Area springs occur adjacent to the mountains and their flow usually terminates within a short distance from the spring head. Aquatic habitat is usually limited to the spring head and associated pools. Exceptions include Comins Lake and Bassett Lake, located in south and central Steptoe Valley, respectively, and the restricted well-fed Shoshone Ponds in southern Spring Valley. Bassett Lake is fed by Duck Creek, which arises in the Schell Creek Range, and Tailings Creek,

which originates from springs southeast of McGill, while Comins Lake receives water from Cave Creek, Williams Creek, and Willow Creek, which originate in the Egan Range (Hubbs, et al., 1974).

3.4.2 Important Species

Important fish species include game fish and fish species listed as threatened or endangered by the federal government or State of Nevada or species under review for listing as threatened or endangered. The Pahrump killifish is the only aquatic species in the WPPP area that is currently listed by the USFWS as endangered and is discussed in greater detail in Chapter 8. This species inhabits Shoshone Ponds in Spring Valley. The status of a number of other species are being reviewed by the USFWS (U.S. Department of the Interior, 1982). These are White River spinedace, White River desert sucker, White River springfish, White River speckled dace, Clover Valley speckled dace, Independence Valley speckled dace, Independence Valley tui chub, Meadow Valley Wash desert sucker, Meadow Valley Wash speckled dace, Big Springs spinedace, relict dace and Bonneville (Utah) cutthroat trout. (Common and scientific names of aquatic species are listed in Appendix D.)

The relict dace (or Steptoe dace) originally inhabited the Pleistocene lakes of the Great Basin approximately 10,000 years ago. As these lakes evaporated and receded, this small minnow became isolated in: 1) warm thermal springs; 2) non-thermal springs and creeks; and 3) ponds and intermittent lakes in Ruby Valley, Butte Valley, Goshute Valley, and Steptoe Valley in northeastern Nevada (Vigg, 1982). The relict dace also occurs in the Shoshone Ponds in Spring Valley and in Lookout Springs in Antelope Valley where it has been introduced. Specific habitats and locations of relict dace

and their geographical distribution (Hubbs, et al., 1974) in the WPPP area are listed in Table 3-3 and shown on Figure 3-5.

Although presently not recognized as an endangered species by the USFWS, the status of the Bonneville (Utah) cutthroat trout is currently under review by the USFWS. However, it is considered an endangered sub-species by the International Union for the Conservation of Nature and Natural Resources, an international conservation organization headquartered in Morges, Switzerland (Dodge and Cain, 1972). Within the WPPP area, the Bonneville (Utah) cutthroat trout is restricted to Pine Creek on Wheeler Peak and Goshute Creek in the Cherry Creek Range.

The remaining fish species which are presently being reviewed for consideration as threatened or endangered, are located within three areas: 1) White River Valley; 2) Clover and Independence Valleys; and 3) Condor Canyon and Meadow Valley Wash (Figure 3-6, Figure 3-7, and Table 3-4). The White River and springs in northern White River Valley provide habitat for White River springfish, White River desert sucker, White River speckled dace, and White River spinedace. Springs in Clover and Independence Valley are inhabited by Clover Valley speckled dace, Independence Valley speckled dace, and Independence Valley tui chub, respectively. The Meadow Valley Wash desert sucker and Big Springs spinedace inhabit perennial waters in Condor Canyon and the Meadow Valley Wash speckled dace can be found in perennial water throughout Meadow Valley Wash (Allen, 1983).

4.0 POWER GENERATION SYSTEM

4.1 BUTTE VALLEY SITE

4.1.1 Soils

The Butte Valley Site occurs on gentle, northeast-trending slopes. The site is mostly within elevations of 6200 and 6500 feet.

The soils of the Butte Valley Site are grouped into five mapping units (Figure 4-1). These mapping units contain eight major soil series and one unclassifiable land type (Rock Outcrop). The series are: Sanpete, Oupico, Blimo-Uwell, Raph, Ursine and Lusetti. Properties that are important in the uses and capabilities of these soils are listed in Table 4-1. The interpretation of the soils into range sites by the SCS, which follows the procedures described by Passey et al. (1982) is presented in Table 4-2.

Ursine soils comprise over 26 percent of the acreage of the Butte Valley Site. These soils are characteristically shallow and usually associated with black sagebrush vegetation. The Raph series, a soil characterized by the dominance of shadscale, occurs on over 15 percent of the site. Soils of the Lusetti series are highly susceptible to wind erosion and are in need of protection by maintenance of the natural stand of winterfat which typifies them. The Oupico and Blimo-Uwell have properties favorable to plant growth.

4.1.2 Vegetation

The Butte Valley Site is composed of four ecological sites (SCS, 1981, 1982). An ecological site is distinguished by supporting a distinctive climax native plant community

which is an expression of all the environmental factors (SCS, 1976). The climax or potential community, however, is rarely realized, as grazing and other types of disturbance can greatly alter the community composition. The existing vegetation composition is compared to the ecological site potential to better understand the resource. Ecological sites (delineated as precipitation zones) that occur on the Butte Valley Site are Loamy 8-10, Shallow Calcareous Loam 8-12, Silty 8-10, and Loamy 5-8. The Loamy 8-10 covers the most area and the Silty 8-10 the least (Table 4-3 and Figure 4-1).

The Loamy 8-10 occurs predominantly on terraces, fans, flats, and slopes between about 5000 and 7000 feet elevation (SCS, 1981) and occurs on about 860 acres of the Butte Valley Site. The dominant potential plant community is composed primarily of Indian ricegrass, needle-and-thread, and Wyoming big sagebrush (SCS, 1982). Annual vegetation production (above-ground foliar growth) is estimated at 400 to 800 pounds per acre depending upon yearly growing conditions. The existing vegetation would indicate that the site has departed appreciably from the potential and is in a less than optimal condition. The existing composition is primarily of Wyoming big sagebrush, bud sagebrush and shadscale. Sandberg bluegrass, bottlebrush squirreltail, Indian ricegrass, and pinnate tansymustard are interspersed among the shrubs. Total vegetative cover of the range site is generally less than 20 percent.

About 440 acres of the Butte Valley Site are classified as Shallow Calcareous Loam 8-12 (Table 4-3). This ecological site occupies benches, pediments and terraces in valleys between 5000 and 7000 feet elevation (SCS, 1977). According to the SCS (1982), the potential native community is dominated by black sagebrush, bud sagebrush, Indian ricegrass, and needle-and-thread; grasses comprise about 40 percent of which is representative of all the environmental (Hesser [illegible] 1953). The [illegible] community, however, is merely the result of [illegible] of disturbance and [illegible] community [illegible]. The native vegetation [illegible] the [illegible] Table 4-3 [illegible] 4-4, [illegible]

The total [illegible] cattails, [illegible] acres of [illegible] valley [illegible] community is composed primarily of Indian [illegible] vegetation [illegible] Indian [illegible] grasses.

Though [illegible] (Table 4-3). The [illegible] with [illegible] and [illegible] between [illegible] community [illegible] Indian [illegible] about 40 [illegible] of the total vegetative cover. Although the existing plant community is dominated by black sagebrush, grasses are very sparse. Thus a departure from the potential community is indicated. Subordinate species include Wyoming big sagebrush, low rabbitbrush, and scattered plants of Greene rabbitbrush, bud sagebrush, halogeton, wallflower, winterfat, and pinnate tansymustard. Total vegetative cover is about 20 percent.

Silty 8-10 occupies flats, basins and fans on relatively level topography between 5000 and 7000 feet elevation. Estimated annual production ranges from 300 to 800 pounds per acre (air dry) depending on growing conditions. The native potential plant community is dominated by winterfat and Indian ricegrass which comprise about 25 percent of the total vegetative cover. Deterioration of the ecological site is reflected by a decrease in winterfat and grasses and an increase in shadscale and halogeton (SCS, 1982). The existing vegetation is dominated by winterfat, which comprises most of the 12 percent total cover. Only halogeton and pinnate tansymustard occur as associates, and both are quite sparse. About 340 acres of the Butte Valley Site is mapped as Silty 8-10 ecological site.

Loamy 5-8 occurs on fans, pediments and terraces at slightly lower elevations (4500 to 6000 feet) than the Loamy range site and represents a more xeric environment (SCS, 1982). About 830 acres of the Butte Valley Site are mapped as Loamy 5-8. The shadscale-dominated community prevails, but bud sagebrush and winterfat often occur in nearly pure stands. Change in species dominance probably reflects differences in soil sodium concentrations (SCS, 1981). Fourwing saltbush and a number of other forbs and grasses occur as minor associates of the native potential vegetation. Grasses comprise about 25 percent and shrubs 75 percent of this association. Annual production of this ecological site is estimated to range

between 250 and 700 pounds per acre (air dry) depending upon the year (SCS, 1983). The existing vegetation composition is somewhat similar to the potential. Shadscale predominates with a foliage cover of about ten percent, and Wyoming big sagebrush occurs as a major associate. Less abundant species include Sandberg bluegrass, bottlebrush squirreltail, Indian ricegrass and pinnate tansymustard. Large areas of shadscale have been killed by insect infestations or rodent damage.

4.1.3 Terrestrial Wildlife

No big game species are known to consistently use shrub-steppe habitats on the Butte Valley Site, but it is within an area being considered for pronghorn introduction (NDOW, no date). Additionally, mule deer winter range occurs on adjacent benches and bands of wild horses frequent the area. Sage grouse occur in the area but no leks or wintering areas have been located on the site. A ferruginous hawk nest is present in the southwest corner of the site. Additionally, one wintering bald eagle was reported using the portion of Butte Valley that occurs in the County (Perkins, 1981).

4.1.4 Aquatic Ecology

No aquatic species or potential habitat are known to occur on or immediately adjacent to the Butte Valley Site.

4.2 NORTH STEPTOE VALLEY SITE

4.2.1 Soils

Soil units of the North Steptoe Valley Site are distinguished according to location on the gentle slope from the southeast to the northwest between elevations of 6000 and 5900 feet.

The soils of the North Steptoe Valley Site are grouped into four mapping units (Figure 4-2). These mapping units contain seven major soil series. The series are Sanpete, Dera, Duffer, Equis, Boofus, Riepe and Stimca. Properties that are important in the use and capabilities of these soils are listed in Table 4-1.

Approximately 42 percent of the site is comprised of a mapping unit containing soils of the Riepe and Stimca series. These soils are characterized by high pH, moderate salinity and high percentages of exchangeable sodium.

The Boofus soil has limitations that impose restrictions on plant growth to the extent that the land is nearly barren except for patches of greasewood and other saline-alkaline tolerant plants. The Boofus, Duffer, and Equis soils together comprise 43 percent of the site. Soils of the subirrigated lowlands are characterized by the Duffer and Equis series. Upland soils series consist mainly of the Sanpete and Dera units.

4.2.2 Vegetation

The area proposed for the North Steptoe Valley Site is composed of the following seven ecological sites: 1) Sodic Terrace 6-8; 2) Loamy 8-10; 3) Sodic Terrace 8-10; 4) Loamy 5-8; 5) Sodic Flat 5-12; 6) Saline Meadow 5-12; and 7) Saline Bottom 5-12.

Big sagebrush and black greasewood communities cover a majority of the North Steptoe Valley Site, but shadscale and several graminoid-dominated communities are also abundant.

A transition of xeric upland to hygric meadow vegetation occurs on the site from Highway 93 to the Duck

Creek drainage area on the west. This transition is reflected by the large number (seven) of ecological sites that occur in the area (SCS, 1981) and a high diversity of plant communities. Sodic Terrace 6-8 and Loamy 5-8 cover the most area of the North Steptoe Valley Site and Saline Meadow 5-12, Saline Bottom 5-12, and Sodic Flat 5-12 the least (Table 4-3).

Sodic Terrace 6-8 and Sodic Terrace 8-10 are associated with flats, gentle slopes and basins between 4500 and 7000 feet elevation (SCS, 1977). Average annual precipitation is 5 to 12 inches with production estimated at 300 to 600 pounds per acre for Sodic Terrace 6-8 and 350 to 800 pounds per acre for Sodic Terrace 8-10 (Table 4-2). Black greasewood and shadscale act as co-dominants of the potential native vegetation. Other important shrub species are basin big sagebrush, bud sagebrush, and spiny hopsage. Basin wildrye, Indian ricegrass, sand dropseed and inland saltgrass, are interspersed among the shrubs. Forbs form only a minor component of the vegetation. The existing vegetation exhibits some similarity to the potential community. Black greasewood characterizes the vegetation, but rubber rabbitbrush and shadscale are quite abundant. Other less abundant species are low rabbitbrush, cheatgrass brome, alkali cordgrass, and claspingleaf pepperweed. Total vegetative cover is variable, but ranges between 35 and 40 percent.

Annual production for Loamy 8-10 is estimated at 400 to 800 pounds per acre (air dry) depending on precipitation (SCS, 1981). The native potential community is dominated by a Wyoming big sagebrush and low rabbitbrush dominated shrub stratum with a number of grasses (Indian ricegrass and needle-and-thread) interspersed as the understory. The existing vegetation contains an appreciable amount of black greasewood, in addition to Wyoming big sagebrush and low rabbitbrush, whereas grasses are scarce. Other species less abundant

than the potential are black sagebrush, gooseberryleaf mallow, milk-vetch and claspingleaf pepperweed. Total vegetative cover varies between about 25 to 30 percent. About 110 acres of the North Steptoe Valley Site are mapped as Loamy 8-10.

Shadscale is the dominant species of the Loamy 5-8 native potential community, although bud sagebrush, winterfat and fourwing saltbrush are also prominent (SCS, 1981). These species are quite variable in abundance, depending on soil salinity, and may occur in nearly pure stands. Indian ricegrass and needle-and-thread are important components of the potential community. The existing vegetation, although characterized by shadscale dominance, contains only a few elements of the potential community species. Indian ricegrass and bottlebrush squirreltail are sparse and, along with scattered field pennycress and claspingleaf pepperweed, are the only associate species. This ecological site covers about 740 acres of the North Steptoe Valley Site.

The Sodic Flat 5-12 ecological site is dominated by black greasewood which, together with alkali sacaton and inland saltgrass, indicates sodic soils (SCS, 1981). Gray molly, shadscale, bud sagebrush, and rubber rabbitbrush, along with black greasewood, form a prominent shrub stratum. Other species of note are basin wildrye and western wheatgrass. The existing vegetation is relatively diverse although much of the total cover is composed of black greasewood. The shrub stratum also contains littleleaf horsebrush, rubber rabbitbrush, gray molly, bud sagebrush, shadscale, and Greene rabbitbrush. A number of other species are present, but are not as abundant (basin wildrye, claspingleaf pepperweed and thelypody). The remaining 22 acres of the North Steptoe Valley Site are comprised of minor amounts of Saline Meadow 5-12, Saline Bottom 5-12, and Sodic Flat 5-12.

Saline Meadow 5-12 occurs predominantly near seeps and springs of the Duck Creek drainage. The community composition varies depending on the amount of water and salts (SCS, 1981). Typically, alkali sacaton, alkali cordgrass and inland saltgrass are major species of the native potential meadow community. A number of other grass-like species including sedges and bulrush can also be important. Shrubs are not usually prominent but black greasewood, fourwing saltbrush and rubber rabbitbrush are common. The potential native community is relatively productive (750 to 3000 pounds per acre air dry), and total vegetative cover generally ranges from 60 to 90 percent (SCS, 1981). The existing vegetation shows similarity to the potential community; alkali sacaton and inland saltgrass form most of the cover. Other common, but less abundant species are baltic rush, bottlebrush squirrel-tail, sedges, and dock. Black greasewood occurs sporadically in the community.

4.2.3 Terrestrial Wildlife

The North Steptoe Valley Site is within year-round range for pronghorn while winter range is located on the benches immediately east of the site. Mule deer winter range is located on the benches southeast and west of the site. Wild horses also occur in the Steptoe Valley and probably use the site occasionally. During the winter of 1981-1982 bald eagles were observed in the Steptoe Valley on four occasions (Perkins, 1981). One peregrine falcon was sighted in Goshute Canyon west of the site in 1980 (Barber, 1983).

4.2.4 Aquatic Ecology

No aquatic species or potential habitat is known to exist on or immediately adjacent to the North Steptoe Valley Site. However, Goshute Creek, located approximately five

miles northwest of the site and is inhabited by a relatively pure strain and self-sustaining population of Bonneville (Utah) cuttroat trout. Goshute Creek originates in the Cherry Creek Range at approximately 7500 feet, flowing an average 1.2 cfs for approximately 7 miles before entering the North Steptoe Valley (Walstrom, 1973). During years of normal precipitation, Goshute Creek disperses beneath the alluvial valley surface shortly after it reaches the open valley, thereby, restricting aquatic habitat to the higher elevations.

4.3 SPRING VALLEY SITE

4.3.1 Soils

The Spring Valley Site occurs primarily on gently sloping valley positions between elevations of 6000 feet along the west boundary to 5800 feet on the east. The soils of the Spring Valley Site are grouped into three mapping units (Figure 4-3). These mapping units contain three major soil series: Sanpete, Ursine, and Lusetti. Properties that are important for land use and reclamation capabilities of these soils are listed in Table 4-1.

4.3.2 Vegetation

The area proposed for the Spring Valley Site is composed of the following ecological sites: 1) Loamy 8-10; 2) Shallow Calcareous Loam 8-12; and 3) Silty 8-10. Shallow Calcareous Loam 8-12 comprises the most acreage and Loamy 8-10 the least (Table 4-3).

Species composition of potential native vegetation is synonymous with ecological sites described in Section 4.1.2 and Section 4.2.2. The existing composition and foliage cover is somewhat variable; and therefore, comparisons between potential and existing types are again made.

Loamy 8-10 is characteristic of terraces, flats, benches, and the toes of slopes between 5000 and 7000 feet elevation. This ecological site covers about 500 acres of the Spring Valley Site (Table 4-3). Annual production of this ecological site is estimated to vary from 400 to 800 pounds per acre (air dry) depending on precipitation (Table 4-2). The potential native plant community is dominated by Indian ricegrass and Wyoming big sagebrush. Important associates are needle-and-thread, Sandberg bluegrass, low rabbitbrush and bottlebrush squirreltail. Composition of the existing vegetation is fairly similar to the potential community. However, grasses, except for some Indian ricegrass and bottlebrush squirreltail are sparse. Other differences include a prominence of black sagebrush and winterfat, and the near absence of several shrubs (e.g. Wyoming big sagebrush).

Shallow Calcareous Loam 8-12 is dominated by black sagebrush that occurs primarily on benches, terraces, slopes and in valleys between 5000 and 7000 feet elevation. In addition to black sagebrush, the native potential community is composed mainly of bud sagebrush, Indian ricegrass and needle-and-thread. A number of additional species characterize the community including winterfat, low rabbitbrush, basin wildrye and bearded bluebunch wheatgrass. The annual production is estimated to be 400 to 950 pounds per acre (air dry) depending on the seasonal growing conditions (SCS, 1981). The existing vegetation, although composed primarily of black sagebrush, has only two percent cover of grasses (Indian ricegrass, Sandberg bluegrass). Other important species are low rabbitbrush, rubber rabbitbrush, Greene rabbitbrush and sparsely scattered forbs (Table 4-3). This ecological site occurs on about 1000 acres of the Spring Valley Site.

About 825 acres of the Spring Valley Site are mapped as Silty 8-10. This site occurs primarily on flats, basins,

and fans between 5000 and 7000 feet elevation (SCS, 1981). Annual production is estimated to be 300 to 800 pounds per acre (air dry) depending on growing conditions. Silty 8-10 is characterized by winterfat. Prominent associated species of winterfat are fourwing saltbush, bud sagebrush, Indian ricegrass, needleandthread, bottlebrush squirreltail, and bearded bluebunch wheatgrass. A number of other shrubs, grasses and forbs occur sporadically, but together characterize the potential community (basin big sagebrush, shadscale, horsebrush, low rabbitbrush, basin wildrye, galleta, western wheatgrass, phlox, gooseberryleaf mallow and buckwheat). The existing vegetation, by contrast is quite sparse. Most of the cover is equally composed of winterfat and halogeton. Other species present are Indian ricegrass, gooseberryleaf mallow and wild buckwheat, all with cover of less than one percent. The low number of species, and especially the low percentage of grass cover appears to be due to livestock grazing pressure.

4.3.3 Terrestrial Wildlife

The Spring Valley Site is within a year-round range for pronghorn. Winter and spring range for mule deer occurs northwest of the site on the east slope of the Schell Creek Range and there are several wetland areas north and south of the site. Bald eagles were observed on six occasions in Spring Valley during the winter of 1981-1982 (Perkins, 1981).

4.3.4 Aquatic Ecology

No aquatic species or potential habitat is known to occur on or immediately adjacent to the Spring Valley Site. However, Pine Ridge Creek, which is inhabited by Bonneville (Utah) cutthroat trout, is located approximately five miles east of the site and the Shoshone Ponds, which are inhabited

by Pahrump killifish, are located approximately six miles southeast of the site.

5.0 WATER SUPPLY SYSTEM

5.1 BUTTE VALLEY SITE WELL FIELDS AND PIPELINE CORRIDORS

Figure 5-1 shows the locations of the well fields and pipeline corridors associated with the Butte Valley Site.

5.1.1 Soils

Soils of the well fields and pipeline corridors associated with the Butte Valley Site are generally within the mapping units shown on Figure 3-1. The most extensive mapping unit is 202, which includes deep soils of alluvial fans and terraces in Steptoe Valley. These soils are generally well-drained, have moderate to rapid permeability, a high available water capacity and slight erosion hazards. These soils have few limitations for land use and reclamation potential. The next most extensive soil mapping unit in the well fields area is 218. The soils of this unit are generally shallow, well-drained, and have moderately rapid to moderate permeability. Their available water-holding capacity is low to moderate and wind erosion hazard is moderate.

The pipeline corridor connecting the well fields and the Butte Valley Site crosses soil mapping units 202, 301, 302, 218, 505, 203 and 214. Soils of the 202, 301, 302, 203 and 214 mapping units do not present reclamation difficulties. Steep slopes, and stony soils will be a major problem of soils grouped into mapping unit 505. Shallow soils will cause mapping unit 218 to be moderately difficult to reclaim.

5.1.2 Vegetation

The vegetation of well field areas is similar in most respects to that described for the Butte Valley Site

(Section 4.1.2). Well fields to the south and east of the site occur in Salt Desert Shrub and transitional desert shrub that is composed primarily of shadscale, black greasewood, and winterfat-dominated communities (SCS, 1977). The well field to the west of the site occurs in Northern Desert Shrub vegetation of big sagebrush- and black sagebrush-dominated communities.

The pipeline corridors also cross the northern desert and salt desert vegetation from the nearby well fields. An exception to this is the pipeline corridor from Cherry Creek which crosses upland areas containing pinyon-juniper woodland, and open areas of black sagebrush, Wyoming big sagebrush and seeded grassland of crested wheatgrass and Russian wildrye.

5.1.3 Terrestrial Wildlife

Sage grouse leks are known to occur in the vicinity of well fields to the south and west of the Butte Valley Site. An unusually large lek occurs in the vicinity of the well field south of the site (NDOW, no date; Perkins, 1982). Additionally, the well field northwest of the site is within sage grouse winter range, and a ferruginous hawk nesting area (NDOW, no date). Sage grouse winter ranges are limited in extent and are frequently essential to the survival of the population (Braun, et al., 1977).

5.1.4 Aquatic Ecology

No aquatic habitat exists on or near the portion of the well field in Butte Valley. However aquatic habitat does occur near the portion of the well field in North Steptoe Valley. These aquatic habitats include two major spring areas: 1) the Cardano Ranch Springs, located approximately

six miles northeast of the well field; and 2) Warm Springs (railroad station) near Monte Neva Hot Springs, approximately ten miles south of the proposed well field. The Cardano Ranch Springs are seasonally abundant with aquatic vegetation including nasturtium, stonewort, potamogeton, pondweed, mare's tail, and filamentous algae (Hubbs, et al., 1974). These springs are also inhabited by relict dace, annelids (leeches), and mollusks (snails). Warm Springs habitat is comprised of a slough which is also inhabited by relict dace (Hubbs, et al., 1974). The pipeline corridor connecting the Steptoe Valley well field with the Butte Valley Site parallels Egan Creek. An average discharge of 1.5 cfs (Walstrom, 1973) in Egan Creek provides approximately 2.8 miles of habitat for rainbow trout. Egan Creek has recently been considered a viable stream for transplanting Bonneville (Utah) cutthroat trout from the self-sustaining population in Goshute Creek (Suminski, 1982).

5.2 NORTH STEPTOE VALLEY SITE WELL FIELDS AND PIPELINE CORRIDORS

Figure 5-2 shows the locations of the well fields and pipeline corridors associated with the North Steptoe Valley Site.

5.2.1 Soils

The soils of the well fields associated with the North Steptoe Valley Site are essentially the same as those of the Butte Valley Site. Descriptions of the soils within the proposed well fields are included in Section 4.1.1. Mapping unit 202 will be the most extensive soil unit crossed by the pipeline corridor. Soils of mapping unit 202 have few reclamation limitations.

5.2.2 Vegetation

The well fields and pipeline corridors southeast and south of the North Steptoe Valley Site are located in Northern Desert Shrub vegetation (SCS, 1977). Wyoming big sagebrush and black sagebrush are the dominant plant communities. However, low rabbitbrush, bud sagebrush, shadscale and black greasewood communities occur locally within the sagebrush matrix. Wyoming big sagebrush is associated with deeper soils and black sagebrush with thinner, more calcareous soils (SCS, 1977). It is expected that the ecological sites delineated for the North Steptoe Valley Site (see Section 4.2.2) will also occur on areas proposed for well field and pipeline corridor development. These ecological sites are associated with Salt Desert Shrub and Northern Desert Shrub vegetation. The exception is areas above about 6000 feet that contain pinyon-juniper associated with ecological sites.

The well field near Cherry Creek contains primarily Northern Desert Shrub vegetation, but pinyon-juniper woodland is also present at elevations above about 6200 feet (SCS, 1977). Utah juniper, although often sparse, characterizes this vegetation, and pinyon is rare as an associate. Conversely, Wyoming sagebrush, basin big sagebrush and black sagebrush form a nearly continuous shrub understory. Common associates include rubber rabbitbrush, Indian paintbrush, beardtongue, wild buckwheat, silky lupine and milkvetch.

5.2.3 Terrestrial Wildlife

Mule deer winter range is present on the well fields to the west of the North Steptoe Valley Site, while pronghorn winter range is present on the well fields immediately east and south of the site. A ferruginous hawk nest, active in 1982, is present on the proposed well field area immediately to the east of the site.

5.2.4 Aquatic Ecology

Aquatic habitat occurring on or immediately adjacent to the well fields and pipeline corridors consist of small streams and numerous springs. The northern Steptoe Valley streams include Cherry Creek and Indian Creek. Cherry Creek originates in the Cherry Creek Range and flows approximately 0.5 miles with an average discharge of 0.05 cfs (Walstrom, 1973). Aquatic species of Cherry Creek consist primarily of rainbow trout. Major springs lie adjacent to pipeline corridors and include the Cardano Ranch Springs and Warm Spring (railroad station) which are inhabited by the relict dace (Hubbs, et al., 1974). These springs are discussed in detail in Section 5.1.4. Relict dace habitat is present in numerous springs along the eastern base of the Cherry Creek Range.

5.3 SPRING VALLEY SITE WELL FIELDS AND PIPELINE CORRIDORS

Figure 5-3 shows the locations of the well fields and pipeline corridors associated with the Spring Valley Site.

5.3.1 Soils

Soils of the well fields associated with the Spring Valley Site are, to a major degree, those of mapping units 217 and 218. The soils within these mapping units are on alluvial fans, are shallow, well-drained, have moderately rapid to moderate permeability and low to moderate available water capacity. Erosion hazard is slight to moderate. These soils have limitations in their land uses and reclamation potential, primarily because of their shallow depths.

A second mapping unit for the well fields is 204. The soils of this unit are generally deep soils of alluvial fans and terraces. They are well-drained, have moderate

permeability and high available water capacity. Erosion hazard is moderate. Soils of this unit have few limitations to land use and reclamation potential.

Soils of the water pipeline corridors connecting the well fields to the Spring Valley Site are generally similar to those of the well fields and include mapping units 217, 204, and 213. Soils of group 204 would provide excellent reclamation properties but soils in group 213 and 217 have moderately severe erosion and reclamation limitations. The principal restrictive properties of soils in 213 are salinity and possible alkalinity. Soils of mapping unit 217 are quite shallow.

5.3.2 Vegetation

The vegetation of the well fields and pipeline corridors is similar to that described for the Spring Valley Site (Section 4.3.2). Thus Loamy 8-10, Shallow Calcareous Loam 8-12, and Silty 8-10 ecological sites would occur on these areas. Some floristic differences occur where well fields are located on benches at slightly higher elevations (6200 feet). For instance, the black sagebrush community often includes appreciable amounts of desert Indian paintbrush as an understory species.

The well fields, for the most part, occur in Northern Desert Shrub vegetation (SCS, 1977). This unit is primarily composed of Wyoming big sagebrush- and black sagebrush-dominated communities. Important associates of big sagebrush are rubber rabbitbrush, low rabbitbrush, bud sagebrush, prickly pear and Indian ricegrass. The black sagebrush community is associated with relatively shallow soils and contains low rabbitbrush, bud sagebrush, Wyoming big sagebrush and winterfat as subordinate species.

permeability and high available water capacity. Erosion hazard is moderate. Soils of this unit have few limitations to land use and reclamation potential.

Soils of the water pipeline corridors connecting the well fields to the Spring Valley site are generally similar to those of the well fields and project mapping units 217, 204, and 119. Soils of group 204 would provide excellent reclamation properties but soils in group 119 and 217 have moderately severe erosion and reclamation limitations. The principal restrictive properties of soils in 217 are salinity and possible alkalinity. Soils of mapping unit 119 are quite shallow.

3.3.2 Vegetation

The vegetation of the well fields and pipeline corridors is similar to that described for the Spring Valley site (Section 3.2.1). Thus, sandy (5-10), Saline Lowland, Loam 8-12, and Shaly 8-10 ecological sites occur in these areas. Some floristic differences occur where well fields are located on benches at slightly higher elevations (6500 feet). For instance, the black sagebrush community often includes appreciable numbers of desert (Utah) [illegible] as an understory species.

The well fields, for the most part, occur [illegible] with Desert Shrub vegetation (SCS, 1971). This unit is primarily composed of Wyoming big sagebrush and black sagebrush-dominated communities. Important associates of big sagebrush are rubber rabbitbrush, low rabbitbrush, bud sagebrush, prickly pear and Indian ricegrass. The black sagebrush community is associated with relatively shallow soils and droughty site conditions, and frequently Wyoming big sagebrush and winterfat as subdominant species.

The well field east of the site occurs near a pygmy sagebrush community, although Wyoming big sagebrush and black sagebrush are the dominant vegetation in the area. This well field is also near a band of swamp cedar and the pipeline corridor crosses this vegetation.

Well fields located west of the site are in open pinyon-juniper woodland. Utah juniper is the prominent tree species, but basin big sagebrush, rubber rabbitbrush, horsebrush, and low rabbitbrush form a prominent shrub understory. The number of forbs in pinyon-juniper woodland is generally greater than in the lower elevation Northern Desert Shrub vegetation. Common species include Indian paintbrush, beardtongue, wild buckwheat, silky lupine and milkvetch.

5.3.3 Terrestrial Wildlife

Well fields for the Spring Valley Site are mostly in shrub-steppe habitat of big sagebrush and shadscale which provide year-round pronghorn habitat. Some of the well fields border on pinyon-juniper habitat. The well field immediately northeast of the site includes part of the sage grouse winter range. Mule deer winter range occurs on the southeast benches of the Schell Creek Range and may be included in the well fields.

5.3.4 Aquatic Ecology

Major aquatic habitats in the vicinity of the Spring Valley well fields include three stream fisheries: Bastian Creek, Willard Creek, and the Shoshone Ponds. Bastian Creek originates at 6800 feet on the east edge of the Schell Creek Range and flows approximately 2 miles before entering the northwest well field. Bastian Creek, with an average flow of 0.75 cfs (Walstrom, 1973) is inhabited by rainbow trout and

brown trout (Stack, 1981). Willard Creek begins its 3.5 mile descent into eastern Spring Valley from approximately 7000 feet on the western slopes of the Snake Range. Average flow in Willard Creek is 0.5 cfs (Walstrom, 1973) and game fish inhabitants include cutthroat trout and rainbow trout. Pine Ridge Creek is located near Wheeler Peak on the west bench of the Snake Range. Originating at 8600 feet, Pine Ridge Creek flows approximately 6 miles and is inhabited by a native population of Bonneville (Utah) cutthroat trout. This native population was the original source for the transplanted population of Goshute Creek. The Shoshone Ponds, a preserve consisting of three well-fed ponds, is located approximately ten miles southeast of the southernmost well field. The Shoshone Ponds contain one of the only two known populations of the endangered Pahrump killifish. The relict dace, a species under USFWS review for threatened or endangered status, also inhabits the Shoshone Ponds.

6.0 POWER TRANSMISSION SYSTEM

Figure 6-1 shows the locations of the power transmission system corridors.

6.1 SOILS

Within the County, transmission line corridors will traverse 22 soil mapping units, which are grouped into 6 broad categories. The first group contains soil mapping units 202, 203, 204 and 211. These mapping units include deep, well-drained soils, having moderate to moderately rapid permeability with generally favorable available water capacities. Wind and water erosion hazard for these soils are generally slight to moderate. These soils are associated with alluvial fans, terraces, and basin-fill plains of the valleys. Slopes are nearly level to gently sloping. The principal areas of these soils within the transmission corridors in the County are: 1) the Jakes Valley Corridor; 2) a distance of several miles in the Egan Basin Alternative; 3) much of the Steptoe Valley Corridor; and 4) a short stretch of the Gonder Corridor.

The second soils group contains soil mapping units, 201, 215, 216, 217, 218 and 219. These shallow soils are primarily associated with alluvial fans of the major valleys and are generally shallow in depth. They are well drained, moderate to moderately rapid in permeability, are generally low in available water capacity, and have moderate wind and water erosion hazards. The principal locations of these soils within the transmission corridors are: 1) a stretch of 25 to 30 miles north of the Nye County line within the Foothills Alternative; 2) much of the distance within the Gonder Corridor; 3) the Muleshoe Alternative after the corridor crosses the Schell Creek Range and proceeds southeasterly; and

4) 10 miles or more south of the Spring Valley Site within the Highway Alternative and Baking Powder Flat Alternative.

A third grouping of soils contains mapping units 214 and 220. These are deep soils of basin-fill plains and flood plains of the main valleys. They are generally well to somewhat poorly drained, have moderately slow to slow permeability, have high water availability capacities, and slight to moderate erosion hazards. These soils have high wind erosion hazards when their vegetative cover is removed. This soil grouping is restricted to portions of Egan Basin Alternative and Egan Range Alternative and Jakes Valley Corridor.

A fourth grouping of soils encompasses those soils of mapping units 212 and 213. These soils are high in salt content and likely contain high exchangeable sodium percentages and high pH. The soils are deep, and were formed on basin-fill plains of the valleys, and have restricted permeability. The water tables are generally between 6 and 20 feet below the surface. Erosion hazards are generally slight but can become severe on denuded areas. Revegetation of these soils requires special treatment and an extended period of time. The Muleshoe Alternative contains considerable amounts of these soils. As the corridor extends southward toward the Spring Valley Site, it traverses 25 to 30 miles of this soil group.

A fifth soil group contains soil mapping units 301 and 302. These soils are affected by the presence of water at or near the surface. They are deep soils of basin-fill plains and flood plains and are generally somewhat poorly to poorly drained. Permeability is moderate to slow, available water capacity is moderate to high and erosion hazards are slight to moderate. Drainage and wetness are the main limitations to

land use and reclamation of these soils. Soils of this group occur in the Egan Basin Alternative and Steptoe Valley Corridor and occasionally in the Gonder Corridor.

The sixth soil grouping contains soils associated primarily with foothills and low mountains. The soil mapping units of this group are 501, 502, 503, 504, 505 and 511. These soils are predominantly shallow to moderately deep, well drained, moderately to moderately rapid in permeability, low to high in available water capacity and have moderate erosion hazards. Steep slopes and stoniness are the major characteristics. The greatest extent of these soils within the County occurs in the Jakes Valley Corridor south from Butte Valley. Soils of this group are also prominent on the Schell Creek Range southwest of the North Steptoe Valley Site. These soils also occur in the Egan Range Alternative east of the Butte Valley Site.

The North Machacek Corridor crosses soils from all three groups: SMUs 214, 203, 503, 216, 502, 213, and 501. The dominant soil properties for each SMU are listed in Table 4-1. The approximate lineal extent of these SMUs is as follows:

- 501, 502, 503 - 29 percent
- 203 - 32 percent
- 213 - 30 percent
- 214 - 9 percent

Generalized soils information for the transmission line corridor can be projected from the soils map (Figure 3-1) into Nye County to where the corridor crosses MLRA 29. This is approximately on an east-west line through Pioche. At this juncture, the distance is 70 to 75 miles to the approximate boundary of MLRA 30.

MLRA 29 is the southern Nevada Basin and Range MLRA. Soils formed from recent alluvium are found in the lower elevations of the basin. These are similar to soils of the Lahontan, Penoyer, Bishop and Pahranagat series which are classed as Fluvents, Orthents, and Aquolls. Upland soils in the coarser alluvial deposits and on wind-worked/wind-deposited sands have characteristics of the Preston and Quincy series and are classed as Psamments. Soils of the steep mountain slopes of this land area are similar to the Theriot series, a Lithic Torriorthent.

The Sonoran Basin and Range MLRA (MLRA 30) is primarily composed of soils with alluvial origins. Recent alluvial soils include Fluvaquents, Fluvents, and Fluventic Subgroups of Inceptisols. Examples of these soils are the Cajon, Gila, Hesperia, and Foster. Calcic great groups of Aridisols occur on or are related to older alluvial fans, terraces, and in the better drained basins. Examples of these Aridisols are the Las Vegas, Mormon Mesa, Adelanto, Superstition, Mohave and Sunrise series. Natric soils occur in the low, wide basins and a characteristic soil series is Pond. Lithic subgroups or orthents also occur frequently on steep mountain slopes in MLRA 30.

6.2 VEGETATION

All transmission line corridors from Butte Valley cross large areas of Northern Desert Shrub and Salt Desert Shrub vegetation complexes in the County (SCS, 1977). Principal plant communities of these units are formed by big sagebrush and black sagebrush in the former, and shadscale, black greasewood and winterfat, in the latter. All corridors cross pinyon-juniper woodland complexes where they extend above about 6800 feet elevation. Scattered pinyon-juniper

trees and a prominent big sagebrush shrub stratum characterize this vegetation.

The vegetation complexes of the transmission line corridors from the North Steptoe Valley Site also include primarily Northern Desert Shrub and Salt Desert Shrub complexes. However, the Steptoe Valley Alternative and Muleshoe Alternative cross areas mapped as meadow and flood plain vegetation (SCS, 1977). This vegetation is characteristic of springs and seeps usually at the lowest elevations of valleys. Dominant species include a number of hydrophytic and halophytic species (basin wild rye, alkali sacaton and inland saltgrass).

Similar vegetation patterns also occur along the transmission line corridors that extend from the Spring Valley Site. Both the Highway Alternative and Baking Powder Flat Alternative cross Northern Desert Shrub and Salt Desert Shrub/transitional desert shrub complexes as they extend south through valleys below about 6800 feet. Where corridors extend above about 6800 feet, such as in the Schell Creek Range, pinyon-juniper woodland is the most conspicuous vegetation, although big sagebrush communities are also common. Both the northern and southern alternatives from the Butte Valley Site and North Steptoe Valley Site to the Machacek Substation primarily cross Northern Desert Shrub complexes of sagebrush. Shadscale-dominated Salt Desert Shrub occurs in areas crossed by the corridors in Long Valley, Newark Valley, and Jakes Valley (SCS, 1977). Pinyon-juniper woodland is also encountered by both corridors, primarily above 6000 feet elevation. The southern alternative crosses an extensive area of pinyon-juniper woodland on the Little Antelope Summit. Mixed coniferous forest occurs on the corridor near the Eureka County/White Pine County line, but pinyon-juniper woodland and sagebrush shrublands are again prominent as the corridor

descends below 8000 feet elevation east of the Machacek Substation.

South of the County, the corridors continue to cross primarily the Great Basin Sagebrush Complex to about the Lincoln County/Clark County line (Kuchler, 1975). Here creosote bush vegetation becomes dominant as the northern extreme of the Mojave Desert is encountered. This vegetation complex includes several creosote bush dominated plant communities. This area generally has less than 6 inches annual precipitation, and mean maximum annual temperatures ranging from 81 to 87°F (Beatley, 1976). A number of other common associate shrub species include indigo bush, range ratany, bursage, shadscale, brittlebush, and spiny hopsage. Summer and winter flowering annuals and several grass species characterize the ground cover during late winter and early spring. Otherwise ground cover of herbaceous species is generally sparse.

The southernmost portion of the transmission line corridors traverse areas of relatively low vegetative cover and annual production. Areas slightly higher in elevation receive more precipitation and contain blackbrush communities; a transitional type between Great Basin and Mojave Desert vegetation. Therefore, blackbrush may be associated with big sagebrush, shadscale and creosote bush (Cronquist, et al., 1972; Beatley, 1976).

6.3 TERRESTRIAL WILDLIFE

Both the shrub-steppe and pinyon-juniper habitats that occur along the transmission line corridors provide winter range for mule deer and year-round range for wild horses. In addition the pinyon-juniper woodland provides nesting habitat for ferruginous hawks. The coniferous forest

habitat of the higher elevation passes is used as summer range by mule deer, and in some areas by elk.

Three sage grouse leks occur in the Jakes Valley Corridor. Two of these are within five miles of the south side of the Butte Valley Site. The third lek is 30 to 35 miles south of the Butte Valley Site.

The Schell Creek Range is inhabited by Nevada's only hunted population of elk which spends winter and spring on the western slope benches, summers in the higher elevation coniferous forest. The Gonder Corridor crosses critical elk habitat in Cooper's Canyon (Dieringer, 1982). Additionally, mule deer winter on the lower benches on either side of the Schell Creek Range and pronghorn are found throughout Spring Valley. One sage grouse lek occurs on the Gonder Corridor (NDOW, no date), approximately eight miles south of Ely. Additionally, two ferruginous hawk nests that were active in 1982 occur within the Gonder Corridor (Perkins, 1982).

Although shrub-steppe habitat dominates the North Steptoe Valley transmission line corridors, small areas of pinyon-juniper woodland and coniferous forest (Muleshoe Alternative) are also encountered. The Muleshoe Alternative, Egan Range Alternative, Egan Basin Alternative and the Steptoe Valley Alternative cross mule deer winter and spring range. Sage grouse leks are present within the Muleshoe Alternative. The Steptoe Valley corridor passes along the west side of pronghorn winter range.

South of the County, mule deer winter range occurs within the Coal Valley Alternative, Foothill Alternative, and Delamar Alternative. In addition, both the Lake Valley Alternative and Muleshoe Alternative cross year-round mule deer range and the Coal Valley Alternative crosses a deer migration route.

The Muleshoe Alternative crosses pronghorn range in Lincoln County that is used all year. A ferruginous hawk nest occurs adjacent to the Foothill Alternative in Nye County just south of the County.

Bighorn sheep range occurs within Delamar Alternative, Pahroc Alternative, and Kane Springs Wash Alternative. Only limited amounts occur within the Delamar Alternative, whereas major amounts of bighorn sheep habitat is located along Kane Springs Wash Alternative and, Pahroc Alternative and Moapa Alternative.

6.4 AQUATIC ECOLOGY

The majority of the transmission line corridors cross arid areas which are void of aquatic habitat. Exceptions include Steptoe Creek in Steptoe Valley, springs near Preston and Lund in White River Valley, and Pinto Creek in the Diamond Range. The Steptoe Valley Corridor, located approximately ten miles southeast of Ely is adjacent to Steptoe Creek. This creek has an average discharge of 5.9 cfs and is inhabited by brown trout, rainbow trout, cutthroat trout and brook trout (Walstrom, 1973). Pinto Creek, which is inhabited by rainbow trout, is crossed by a corridor segment extending westerly toward Eureka County.

The Foothill Alternative and Preston Alternative are adjacent to isolated springs and ponds providing habitat for endemic fish species in the White River Valley. These fish species are under review by the USFWS for consideration as threatened or endangered (U.S. Department of the Interior, 1982). These species include the White River speckled dace, Preston White River springfish, White River spinedace, and White River desert sucker.

7.0 COAL TRANSPORTATION SYSTEM

Figure 7-1 shows the locations of the coal transportation system corridors.

7.1 SOILS

The Butte Valley North Corridor passes over soils that are predominantly of soil mapping units 203 and 214. The Butte Valley South Corridor intercepts steeper foothills and low mountain soils of mapping units 503 and 505. These units primarily contain soils characterized by the Hyzen and Fontreen series. Except for a stretch of another steeper area of soils south of Jakes Valley, the majority of the soils are similar to the Ursine series of the Shallow Calcareous Loam 8-12 ecological site.

The Steptoe Valley North Corridor is located primarily on soils of the loamy soil mapping units 202, 301 and 302. Soils occurring on slopes above these sites are steeper (as shown on Figure 3-1) and are mapped as units 503 and 511. The Schell Alternative enters the County near Highway 93 north of Lages. The predominant soils of this alternative are shown as mapping unit 218, which also extends along the Steptoe Valley South Corridor. Soil mapping units 301 and 302 are characterized by the Equis series and occur within the Steptoe Valley South Corridor near the town of McGill. A high percentage of the soils of the Steptoe Valley South Corridor from McGill south to the Lincoln County line is similar to the Ursine series.

The Spring Valley North Corridor, which would serve the Spring Valley Site, crosses over soil mapping unit 218 for a considerable distance, but stretches of steeper foothill and low mountain soils mapped as 502, 503, and 511 occur within

the corridor. Extensive areas of soil mapping units 301 and 302 occur in the Spring Valley North Corridor. The Spring Valley South Corridor from the Spring Valley Site to the Lincoln County line crosses primarily soil mapping units 217 and 218 with lesser extents of soil mapping units 503 and 204.

Soils in Elko County, Lincoln County, and Nye County that are within MLRA 28 (SCS, 1965) will closely resemble the patterns described above for the County. Soils within the Southern Nevada Basin and Range and the Sonoran Basin and Range (MLRAs 29 and 30) in Lincoln County and Nye County are described in Section 6.1.

7.2 VEGETATION

The vegetation of the railroad corridors north of the three sites is essentially an extension of the patterns described for the sites and adjacent areas. The valley floors contain shadscale and black greasewood components of the Great Basin Sagebrush Formation of Kuchler, or more precisely, Salt Desert Shrub vegetation (SCS, 1977). Shadscale forms communities with winterfat, bud sagebrush and black sagebrush, depending on soil salinity and texture. Low rabbitbrush, kochia and halogeton are often the prominent species of Salt Desert Shrub/transitional desert shrub vegetation depending on the amount of past disturbance, usually grazing.

Black greasewood communities are usually in close proximity to meadow flood plain vegetation of alkali sacaton, basin wildrye and inland saltgrass that occurs near seeps and springs. Small areas of meadow vegetation occur along most of the northern corridors such as the southern flank of Spruce Mountain, Dolly Varden Mountain and the west side of Spruce Mountain Ridge.

Vegetation above the valley floor and on the flanks of ridges is composed primarily of big sagebrush communities. Both basin big sagebrush and Wyoming big sagebrush form communities where soil salinity is reduced. Although common along the valleys of the northern corridors, big sagebrush communities are most prominent on fan piedmont and fan skirt (Peterson, et al., 1981) above the valley floor. Black sagebrush is also present on relatively thin soils that are common among the lower foothills. A number of species occur as codominants with sagebrush, depending mainly on soil conditions. Winterfat, fourwing saltbush, low rabbitbrush and rubber rabbitbrush are common associates of basin big sagebrush and Wyoming big sagebrush. Associates of black sagebrush include bud sagebrush, winterfat, fourwing saltbush and joint-fir (SCS, 1977).

Pinyon-juniper woodland occurs on certain segments of the railroad corridors above about 6000 feet elevation. Such areas are encountered on the Currie Alternative and Spring Valley North Corridor near the Currie Hills and the Butte Valley North Corridor on the southeast flank of the Pequop Mountains. Pinyon-juniper woodland characteristically includes an understory of big sagebrush on sites with a relatively deep soil and black sagebrush where soils are shallow (SCS, 1977). A number of grasses and forbs occur as minor associates of the sagebrush.

Mountain brush communities, of curlleaf mountain mahogany intermingle with pinyon-juniper on some slopes, usually above 7500 feet elevation. These communities form a transition from woodland to the mixed conifer forest of higher elevations (SCS, 1977). Mountain brush vegetation is not generally encountered on the corridors, but occurs sporadically along with pinyon-juniper woodland at the southern end of the Antelope Alternative near Boone Canyon and Boone Spring Hills.

The railroad corridors south of the three WPPP sites primarily cross salt desert vegetation of shadscale and big sagebrush-black greasewood with some exceptions. Areas of big sagebrush and pinyon-juniper woodland are present along the Steptoe Valley South Corridor near Willow Spring Canyon, and where the corridor crosses the Schell Creek Range. As described above, saline meadow vegetation occurs sporadically on most corridors near seeps. Such areas are more prominent in the Butte Valley South Corridor and Steptoe Valley South Corridor than in the Spring Valley South Corridor. The latter two corridors also encompass scattered stands of swamp juniper and pygmy sagebrush. The pattern of big sagebrush on deep soils, black sagebrush and low sagebrush on shallow soils, and shadscale and black greasewood on saline soils of the valley floors reoccurs south of the County to about the Clark County Line. Elements of the Mojave Desert, such as Joshua-tree and blackbrush, do not form a conspicuous part of the vegetation further north than about the Delamar Mountains, and thus are not present in any of the corridors.

7.3 TERRESTRIAL WILDLIFE

With the exception of limited amounts of pinyon-juniper and coniferous forest crossed by the Egan Creek Pass Alternative, shrub lands are the main habitat types within the railroad corridors.

Within the County, the Butte Valley South Corridor contains one sage grouse lek, at least three ferruginous hawk nests, a wetland area and summer range for mule deer. After leaving the County, the corridor enters the White River Valley which is inhabitated by a diverse flora, fauna and is an area of concern to the NDOW (Molini, 1982).

Railroad access to the Butte Valley Site from the north can be provided by either the Butte Valley North Corridor or the Egan Creek Pass Alternative which connects with the Steptoe Valley North Corridor. In the County, one sage grouse lek, a sage grouse wintering area, and a bald eagle wintering area are located within the Butte Valley North Corridor. In comparison, the Egan Creek Pass Alternative contains two sage grouse leks, a pronghorn migration route, spring habitat for mule deer and is located adjacent to a raptor nesting area. In Elko County, the Butte Valley North Corridor contains three additional sage grouse leks, a sage grouse wintering area and a mule deer migration route (NDOW, no date). The Clover Valley Alternative, which is an alternative route for a portion of the Butte Valley North Corridor, contains four sage grouse leks and a limited amount of spring range for mule deer.

The North Steptoe Valley Site has two northern corridors (Steptoe Valley North Corridor and Schell Alternative) that can provide rail access to the site. Within the County, both corridors cross year round range for pronghorn. The Schell Alternative extends only a short distance into Elko County before it connects with either the Currie Alternative or Antelope Alternative. In Elko County, the Schell Alternative crosses year-round pronghorn range. The Steptoe Valley North Corridor in Elko County crosses a large area of pronghorn year round range, a key habitat area for pronghorn, a pronghorn kidding area and a sage grouse lek (NDOW, no date).

Both the Antelope Alternative and Currie Alternative are corridors for parts of either the Steptoe Valley North Corridor or the Spring Valley North Corridor. The Currie Alternative contains a pronghorn kidding area and year-round habitat for pronghorn (NDOW, no date). In comparison, the Antelope Alternative contains year-round habitat for pronghorn

and wild horses, several ferruginous hawk nests, and an important wintering area for bald eagles (Herron 1983).

The Steptoe Valley South Corridor within the County contains five sage grouse leks, major wetland areas, and summer and year round habitat for mule deer. South of the County, the corridor crosses mule deer winter range.

Within the County, the Spring Valley North Corridor crosses pronghorn year-round range, a migration route of pronghorn, a pronghorn kidding area, wetland areas, and summer and winter range for mule deer. In addition, the corridor passes near six sage grouse leks and has the potential to be within viewing distance of raptor nesting areas. In Elko County, the Spring Valley North Corridor crosses pronghorn habitat that is used in all seasons (NDOW, no date).

The Spring Valley South Corridor in the County crosses a large area of year-round pronghorn habitat, a pronghorn migration route and year-round habitat for mule deer. South of the County, the corridor crosses year round habitat for both pronghorn and mule deer (NDOW, no date).

7.4 AQUATIC ECOLOGY

Aquatic habitat of importance adjacent to the railroad corridors within the County is confined to the Spring Valley North Corridor and Butte Valley South Corridor. Aquatic habitat adjacent to rail corridors in Spring Valley consist of numerous springs inhabited by relict dace (Section 3.4). A portion of the Butte Valley South Corridor is located in the White River Valley and is in the vicinity of numerous springs inhabited by the White River spinedace, the White River desert sucker, the Preston White River springfish, and the White River speckled dace (Section 3.4).

Outside the County, important aquatic habitat occurs adjacent to railroad corridors in North Butte Valley, White River Valley, Condor Canyon, Meadow Valley Wash, Independence Valley and Clover Valley. The White River in Nye County contains habitat for the White River springfish. In Lincoln County, Condor Canyon contains habitat for the Meadow Valley Wash desert sucker and the Big Springs spinedace; and Meadow Valley Wash contains the Meadow Valley Wash speckled dace (Section 3.4). In Elko County, Independence Valley contains habitat for the Independence Valley speckled dace and the Independence Valley tui chub. The Clover Valley speckled dace is found in springs in Clover Valley and numerous springs inhabited by relict dace occur in North Butte Valley (Section 3.4).

8.0 THREATENED AND ENDANGERED SPECIES

Several endangered animal species and numerous candidate or rare animal and plant species occur within the WPPP area in White Pine County, Lincoln County, Nye County, Clark County, and Elko County. Known distributions and habitats indicate that some of these species occur within areas identified for WPPP facilities. Such species are discussed in the following sections. In addition, these species are analyzed in more detail in the Biological Assessment (Dames & Moore, 1983), prepared in compliance with Section 7 of the Endangered Species Act of 1973.

8.1 PLANT SPECIES

8.1.1 Federally Listed Species

No plant species federally listed as threatened or endangered are known to occur in the WPPP area.

8.1.2 Species of Special Concern

Species of special concern include species that are candidates for federal listing as threatened or endangered as well as species that are listed as threatened and endangered by the State of Nevada. Table 8-1 lists candidate threatened and endangered plant species in the WPPP region.

According to distribution maps of the Nevada State Museum (1983) and Harrison (1980), and habitat information of Mozingo and Williams (1980), three candidate species have potential to occur in the valleys proposed for the three WPPP sites. These species (Great Basin fishhook cactus, lepidium, and Clokey pincushion cactus) are also recognized by the State of Nevada as rare or are on a state watch list.

No sightings of these species were made during the 1981 and 1982 field surveys of the three sites and vicinity.

Because the water well fields and pipeline corridors occur in different habitats, additional candidate species have the potential to occur within these areas. The Monte Neva paintbrush and camus occurs in the vicinity of the well fields and pipelines near the Monte Neva hot springs in Steptoe Valley. The Great Basin fishhook cactus and Monte Neva paintbrush have sufficient information to support a listing (U.S. Department of the Interior, 1980a).

A number of candidate plant species occur on or near proposed transmission corridors. Populations of oval leaf thelypody occur in northern Spring Valley on the Muleshoe Alternative near Schellbourne Pass. The Muleshoe Alternative north and south of the Spring Valley Site crosses populations of draba, Hitchcock bladderpod and Parish phacelia. A population of the phacelia and populations of Clokey pincushion cactus are located within the Muleshoe Alternative near the Geyser Maintenance Station.

Further south, a population of Nye milkvetch occurs near the Pahrangat and Kane Springs Alternatives in Clark County and several populations of bicolored penstemon occur north and east of Las Vegas (Nevada State Museum, 1983).

A number of candidate plant species also occur near or within railroad corridors. The Monte Neva paintbrush occurs near the existing rail line on the Steptoe Valley South Corridor. Darrow buckwheat, Parish phacelia and Clokey pincushion cactus occur on the Spring Valley South Corridor between the Spring Valley Site and the convergence of the Lake Valley Alternative in Lincoln County. Lepidium has been located on the North Clover Valley Alternative in Elko

County about four miles south of State Highway 11 and U.S. Highway 93 junction.

8.2 TERRESTRIAL WILDLIFE SPECIES

8.2.1 Federally Listed Species

The USFWS has indicated that one endangered terrestrial wildlife species, the bald eagle, is likely to occur in the County (Mehrhoff, 1981). Although no bald eagles are known to nest in the County, several overwinter there (Perkins, 1981). Overwintering bald eagles roost in trees and feed on carrion and jackrabbits (Snow, 1973). Peregrine falcons have also been sighted in the County near Goshute Canyon, in the vicinity of Ely, east of Wheeler Peak, and near Sunnyside in Nye County (Barber, 1983).

8.2.2 Species of Special Concern

Three species (spotted bat, gila monster and desert tortoise) are listed as species of particular concern to the NDOW. The ferruginous hawk is under review by the USFWS for listing as threatened or endangered (U.S. Department of the Interior, 1982). The spotted bat is likely to reside in caves throughout the WPPP area, and is of low abundance throughout its range (Herron, 1981). The gila monster is found on lower mountain slopes in the southern end of the WPPP area, near Las Vegas. It is likely to be found in canyon bottoms and near irrigated areas (Stebbins, 1966).

The desert tortoise is found in desert shrub in Lincoln County, Nye County, and Clark County below 4000 feet (Schneider and Turner, 1980) where it burrows in firm, but not compacted ground. This species requires some ground moisture for survival of eggs, and is frequently found near water (Stebbins, 1966). The substratum in many areas is quite rocky

and apparently poor for burrow construction and may be a limiting factor for tortoise populations. In these areas, caliche caves provide permanent tortoise cover sites and tortoise abundance appears to be directly related to the availability of such habitat (Schneider and Turner, 1980). Areas that have been identified as having the highest abundance of desert tortoise occur south of the WPPP area remotely adjacent to transmission line corridors (Schneider and Turner, 1980).

Of the raptors known to occur in the WPPP area, the ferruginous hawk is the most sensitive to human encroachment. The southern boundary of the ferruginous hawk extends only a short distance into Lincoln County (Herron, 1983). Within the WPPP area, most ferruginous hawks nest in juniper trees on the edge of sagebrush communities and the nests are reused each year (Perkins, 1981). Ferruginous hawks will readily abandon their nest if disturbed. Ferruginous hawks inhabit areas throughout the WPPP area.

8.3 AQUATIC SPECIES

8.3.1 Federally Listed Species

The Pahrump killifish is listed as endangered by the USFWS (U.S. Department of the Interior, 1980b). A self-sustaining transplanted population of this species currently inhabits the Shoshone Ponds of southern Spring Valley. The last remaining native habitat of the Pahrump killifish was Manse Spring, Nye County, Nevada, which, since 1975, has been seasonally desiccated in response to nearby groundwater pumping (Sada, 1982). In 1970, Pahrump killifish were transplanted from Manse Spring to Corn Creek Springs on the Desert National Wildlife Refuse. In 1976, a second population of Pahrump killifish was established by transplanting individuals from Corn Creek Springs to the Shoshone Ponds with the intent

that should one population be eliminated, the species would continue to exist (Sada, 1982).

8.3.2 Species of Special Concern

Eleven aquatic species within the WPPP area are of special concern to the NDOW and are being reviewed by the USFWS for listing as threatened or endangered (U.S. Department of the Interior, 1982). These aquatic species have been placed in either of two review categories: 1) adequate biological information is available to appropriately list species as endangered or threatened; or 2) biological information is available which possibly justifies the listing of such species. However, additional biological research and field study may be necessary. It is likely that some of the latter category species will not warrant listing based on biological support (U.S. Department of the Interior, 1982). The fish species in Category 1 include the White River spinedace and the Big Springs spinedace. Category 2 includes relict dace, Bonneville (Utah) cutthroat trout, Clover Valley speckled dace, Independence Valley speckled dace, Independence Valley tui chub, White River speckled dace, Preston White River desert sucker, Preston White River springfish, White River desert sucker, and Meadow Valley Wash desert sucker.

8.3.2.1 Relict Dace

The relict dace or Steptoe dace originally inhabited the Pleistocene lakes of the Great Basin approximately 10,000 years ago. As these lakes evaporated and receded, this small minnow became isolated in: 1) warm thermal springs; 2) non-thermal springs and creeks; and 3) ponds and intermittent lakes in Ruby Valley, Butte Valley, Goshute Valley, and Steptoe Valley in northeastern Nevada (Vigg, 1982). The relict dace also occurs in Lookout Springs in Antelope Valley and has been introduced in the Shoshone Ponds in Spring

Valley. Specific habitats and locations of relict dace and their geographical distribution (Hubbs, et al., 1974) in the WPPP area are listed in Table 3-3 and shown on Figure 3-5.

The relict dace is not recreationally or commercially harvested or considered to provide substantial forage for game fish. Therefore, it is considered a species of minimal economic value. However, this desert fish is endemic to the region and is found in relatively rare habitats, many of which have been eliminated through the development of water resources in the arid west. The intrinsic importance of this unique species lies in its contribution to the diversity of life. The relict dace is classified as "sensitive" by the State of Nevada Board of Wildlife Commissioners (State of Nevada, 1981).

8.3.2.2 Bonneville (Utah) Cutthroat Trout

The Bonneville (Utah) cutthroat trout, like many other subspecies of cutthroat trout, was geographically isolated in headwater streams when large pluvial lakes began receding approximately 25,000 years ago. During the late 1800s, these previously undisturbed pure strain populations began to decrease in response to increasing competition and cross-breeding with introduced non-native species. This decline continued to a point where the only pure strain population believed to exist in the western Lake Bonneville Basin occurred in Pine Ridge Creek on Wheeler Peak in eastern Nevada (Dodge and Cain, 1972). In 1960, Pine Ridge Creek Bonneville (Utah) cutthroat trout were introduced by the NDOW into Goshute Creek, a five-mile-long stream on the eastern side of the Cherry Creek Range in northern Steptoe Valley (Dodge and Cain, 1972). The intent of this transplant was to "assure the perpetuation" of this relatively pure strain of Pine Ridge Creek population. By 1970, the Goshute Creek

population had increased sufficiently to be self-supporting (Dodge and Cain, 1972).

Although not presently recognized as an endangered species by the USFWS, the Bonneville (Utah) cutthroat trout is considered an endangered sub-species by the International Union for the Conservation of Nature and Natural Resources, an international conservation organization headquartered in Morges, Switzerland (Dodge and Cain, 1972). However, recent reports (Barber, 1983) on the status of Goshute Creek and Pine Ridge Creek indicate both Bonneville (Utah) cutthroat trout populations have been adversely affected by severe flooding and sediment loading.

8.3.2.3 Clover Valley Speckled Dace

The Clover Valley speckled dace, a state listed sensitive specie (State of Nevada, 1981), is located in a spring pond and outflow 9.5 miles south of Wells and in Warm Springs at Warm Creek (formerly Clover) Ranch (Hubbs, et al., 1974) (Section 3.4). Both habitats lie adjacent to the proposed Clover Valley Alternative railroad corridor. These springs were, at one time, connected by alluvial Lake Clover which also broadly connected Clover Valley and Independence Valley. These two Clover Valley speckled dace populations have become slightly differentiated during a period when pluvial Lake Clover receded and the two habitats became isolated (Hubbs, et al., 1974). The population inhabiting the spring and pond south of Wells apparently declined during the early 1930s due to the introduction of rainbow trout and diversions of spring water for irrigation. However, by 1965 the population had recovered due to the increase in numbers of adult dace (Hubbs, et al., 1974). Collections of Clover Valley speckled dace in Warm Springs in 1964 and 1965 revealed a suppressed population (Hubbs, et al., 1974). As was the

case in the previously described habitat, rainbow trout had been introduced in Warm Springs and "apparently was forcing the localized form of speckled dace definitely into the seriously endangered category" (Hubbs, et al., 1974). Bullfrogs, which were discovered in the spring in 1965, were probably also contributing to the decline in the dace population (Hubbs, et al., 1974).

8.3.2.4 Independence Valley Speckled Dace

The Independence Valley speckled dace, classified as "sensitive" by the State of Nevada (1981) inhabits Warm Springs, the only known spring complex in Independence Valley. Warm Springs is approximately ten miles north of the existing Western Pacific Railroad and Spruce Mountain Alternative railroad corridor. Population numbers of speckled dace in this spring have been suppressed by the introduction of predators, such as largemouth bass (Hubbs, et a., 1974). Bullfrogs and carp also compete with the speckled dace in Warm Springs (Hubbs, et al., 1974). The bullfrogs were probably introduced in 1956 by the Nevada Department of Fish and Game; however, exact dates of introduction for largemouth bass and carp are not available but probably occurred after 1960 (Hubbs, et al., 1974).

8.3.2.5 Independence Valley Tui Chub

The Independence Valley tui chub is confined to the same spring complex as the Independence Valley speckled dace previously described (Hubbs et al., 1974) and is also classified as "sensitive" by the State of Nevada (1981). This subspecies appears to greatly outnumber its endemic companion. The speckled dace readily seeks refuge amongst the aquatic vegetation while the tui chub can be found in more open waters of the spring (Hubbs, et al., 1974). The Independence Valley

tui chub has encountered the same competition problem from introduced species as the Independence Valley speckled dace.

8.3.2.6 White River Speckled Dace

The White River speckled dace, listed as sensitive by the State of Nevada (1981) inhabits springs within two valleys of the pluvial White River system. These valleys include Pahranagat Valley and northern White River Valley. The northern White River Valley population inhabits Lund Town Springs and Preston Big Springs, which are adjacent to the Preston Alternative and Foothill Alternative transmission corridors and the Butte Valley South railroad corridor (Section 3.4). The population within these two springs has been reduced in numbers due to habitat modification and introduction of exotic species (Hardy, 1979).

8.3.2.7 Preston White River Springfish

The Preston White River springfish, classified as "rare" by the State of Nevada (1981) is a localized subspecie of the White River springfish and inhabits warm springs in northern White River Valley near Preston and Lund, Nevada. Known habitat includes Arnoldsen Spring, Cold Spring, Indian Spring, Lund Town Spring, Preston Big Spring, and Preston Town Spring (Section 3.4) (Williams and Wilde, 1981). The Preston White River springfish, like other relict fish species inhabiting these warm springs, has been reduced in numbers due to exotic or non-native species introduction (Hardy, 1979).

8.3.2.8 White River Spinedace

The White River spinedace, classified as "rare" by the State of Nevada (1981) inhabits cool (65 to 71°F) clear springs in the upper ancient White River system of eastern

Nevada (LaRivers, 1962). Known habitats of the White River spinedace are primarily confined to springs in the vicinity of Preston and Lund and include Arnoldsen Spring, Cold Spring, Lund Town Spring, and Nicholas Spring (Section 3.4). Due to the introduction of exotic species, populations of the White River spinedace have been considerably reduced (Hardy, 1979).

8.3.2.9 White River Desert Sucker

The White River desert sucker classified as "rare" by the State of Nevada (1981) is known to inhabit Arnoldsen Spring, Lund Town Spring, and Preston Big Spring in the northern White River system near Preston and Lund, Nevada (LaRivers, 1962). The Meadow Valley Wash desert sucker occurs in the Condor Canyon area south of Pioche, Nevada (Section 3.4). The White River Valley population is currently rare in all habitats due to the introduction of exotic species and loss of habitat (Hardy, 1979). Datum on the Meadow Valley Wash population is lacking.

8.3.2.10 Meadow Valley Wash Speckled Dace

The Meadow Valley Wash speckled dace is confined to the Meadow Valley Wash in north-central Lincoln County. Although population numbers and exact distribution are not known, suitable habitat, which is considered as any perennial waterbody, occurs throughout Meadow Valley Wash (Allen, 1983).

8.3.2.11 Big Springs Spinedace

Explorations of relict fish populations, conducted by Miller and Hubbs (1960) in 1938 and 1959, indicated a population of Big Springs spinedace once inhabiting a spring-fed marsh approximatly one mile east of Panaca in Lincoln

County to be extinct. This population, at the time it was ruled extinct, was presumed to be the sole representative of spinedace in the remaining waters of pluvial Carpenter River (Miller and Hubbs, 1960). The demise of this population was considered a result of "water diversion and the occasional stoppage of flow in the ditch" connecting the marsh with the spring (Miller and Hubbs, 1960). In 1977 and 1978 NDOW personnel discovered a population of Big Spring spinedace, which is now classified as "protected" by the State of Nevada (1981), inhabiting perennial waters within Condor Canyon (Section 3.4) (Allen, 1983; Hardy, 1979). Status of this population is unknown at this time.

9.0 REFERENCES

Allen, R., 1983, Telephone conversation between Mr. R.E. Quinlan, Aquatic Biologist, Dames & Moore, and Mr. R. Allen, Biologist, Nevada Department of Wildlife, Las Vegas, Nevada, March 25, 1983.

Barber, M., 1983, Correspondence from Mr. M. Barber, Wildlife Biologist, U.S. Bureau of Land Management to Mr. R.E. Quinlan, Biologist, Dames & Moore, July 18, 1983.

Beatley, J.C., 1976, Vascular plants of the Nevada Test Site and Central - Southern Nevada; Ecological and Geographical Distributions. Technical Information Center, Office of Technical Information, Energy Research and Development Administration, 308 pp.

Beetle, A.A., 1978, Antecology of selected woody sagebrush species. In The Sagebrush Ecosystem: A Symposium. College of Natural Resources, Utah State University, Logan, Utah.

Billings, W.D., 1951, Vegetation zonation in the Great Basin of western North America. In Complete Rend, du Colloque sur les Bases Ecologiques de la Regenaution de la Vegetation des Zones Arides, Paris: Union Internat. Soc. - Biol.

Braun, C.E., T. Britt, and R.O. Wallestal, 1977, Guidelines for maintenance of sage grouse habitats. Wildlife Soc. Bull. 5 (3): 99-106.

Bureau of Land Management, 1982, Draft environmental impact statement proposed domestic livestock grazing management program for the Schell Resource Area. Ely, Nevada.

Cowardin, L.H., V. Carter, F.C. Golet, and E.T. LaRoe, 1979, Classification of wetlands and deep water habitats of the United States. U.S. Fish and Wildlife Service, Biological Services Program, FWS/OBS-79/31, Washington, D.C.

Cronquist, A., A.H. Holmgren, N.H. Holmgren, and J.L. Reveal, 1972, Intermountain flora, vascular plants of the Intermountain West, USA Vol. I New York Botanical Garden, Hafner Publishing Co., Inc. New York and London.

Dames & Moore, 1983, Biological Assessment, October.

Dieringer, A., 1982, Letter from Mr. A. Dieringer, Director, Nevada Department of Wildlife, to Mr. John Sparbel, State Planning Coordinator, State Clearinghouse, Carson City, Nevada, March 23, 1982.

Dodge, F.H. and D.R. Cain, 1972, Our public lands - More than just a fish. U.S. Department of the Interior, Bureau of Land Management, Ely, Nevada.

Gilbertson, L., 1982, Telephone conversation between Dr. P.R. Davis Wildlife Biologist, Dames & Moore and Mr. L. Gilbertson, Biologist, Nevada Department of Wildlife, Ely, Nevada, July 29, 1982.

Hardy, R., 1981, Telephone conversation between Dr. L.R. Hettinger, Plant Ecologist, Dames & Moore and Mr. R. Hardy, Botanist, Bureau of Land Management, Ely, Nevada, December 1, 1981.

Hardy, T., 1979, The Inter-Basin area report, 1979. U.S. Department of the Interior and the State of Nevada, Reno, Nevada.

Harrison, B.F., 1980, Botanical survey threatened, endangered and other rare plants of the Schell Resource Area Ely District, Nevada. Prepared by Inter-Mountain Research Corporation for Bureau of Land Management, Ely, Nevada.

Henningson, Durham & Richardson, 1980, Environmental characteristics of alternative designated deployment areas: native vegetation. M-X Environmental Technical Report prepared for United Staes Air Force Ballistic Missile Office, Norton Air Force Base, California.

Herron, G., 1981, Telephone conversation between Dr. P.R. Davis, Wildlife Biologist, Dames & Moore, and Mr. G. Herron, Nongame Biologist, Nevada Department of Wildlife, Elko, Nevada, March 24, 1981.

_____, 1983. Conversation between Mr. G. Herron, Nongame Biologist, Nevada Department of Wildlife, Reno, Nevada and Mr. Q. Bliss, Biologist, Dames & Moore, April 7, 1983.

Hubbs, C.L., R.R. Miller, and L.C. Hubbs, 1974, Hydrological history and relict fishes of the North-Central Great Basin. Memoirs of the California Academy of Sciences, Vol VII, 259 pp.

Kuchler, A.W., 1975, Potential Natural Vegetation of the Coterminus United States. 2nd ed. American Geographical Society, New York, New York.

Kufeld, R.C., O.C. Wallmo, and C. Feddema, 1973, Foods of the Rocky Mountain mule deer. USDA Forest Service, Res Paper RM 111.

La Rivers, 1962, Fishes and Fisheries of Nevada State Printing Office, Carson City, Nevada, 782 pp.

Lindsey, K., 1983, Telephone conversation between Dr. L.R. Hettinger, Plant Ecologist, Dames & Moore, and Ms. K. Lindsey. BLM, Ely, Nevada, June 2, 1983.

McQuivey, R.R., 1979, The desert bighorn sheep of Nevada. Biological Bulletin No. 6, Nevada Department of Wildlife, Reno, Nevada.

_____, 1981, 1981 River Mountain bighorn sheep herd population status and trend report. Nevada Department of Wildlife, Reno, Nevada.

McQuivey, R.R. and D.M. Leslie Jr., 1976. The status and trend of desert bighorn sheep in Nevada River Mountains. Special Report 77-9 Federal aid in Wildlife Restoration Project W-48-8 Study R-III Job I, Nevada Department of Wildlife, Reno, Nevada.

Mehrhoff, L.A., 1981, Letter from Mr. L.A. Mehrhoff, Area Manager, U.S. Fish and Wildlife Service, Boise, Idaho to Dr. P.R. Davis, Wildlife Biologist, Dames & Moore, February 17, 1981.

Miller, R. R., and C. L. Hubbs, 1960, The spiny-rayed cyprinid fishes (Plagopterini) of the Colorado River system. University of Michigan Museum Zoology Miscellaneous Publication 115:1-39, Ann Arbor, Michigan.

Molini, W., 1982, Letter from Mr. W. Molini, Director, Nevada Department of Wildlife to Mr. J. Sparbel, Nevada State Planning Coordinator, State Clearinghouse, Carson City, Nevada, April 27, 1982.

Mozingo, N.H. and M. Williams, 1980, Threatened and endangered plants of Nevada; an illustrated manual. Bureau of Land Management, Reno, Nevada and U.S Fish and Wildlife Service, Portland, Oregon.

National Oceanic and Atmospheric Administration, 1979, Local climatological data, annual summary with comparative data, 1979 Ely, Nevada. National Climatic Center, Asheville, North Carolina.

Nevada Department of Wildlife, no date, Unpublished files, Wildlife distribution maps. Reno, Nevada.

Nevada State Museum, 1983, Nevada threatened and endangered plant workshop proceedings. Carson City, Nevada.

Odum, E.P., 1971, Fundamentals of Ecology. W.B. Saunders Co., Philadelphia, Pennsylvania.

Oosting, H.J., 1956, The Study of Plant Communities. W.H. Freeman and Co., San Francisco, California.

Passey, H.B., V.K. Hugie, E.W. Williams, and D.E. Ball, 1982, Relationships between soil, plant community, and climate on rangelands of the Intermountain West. Soil Conservation Service Tech Bull No. 1669 U.S. Government Printing Office, Washington, D.C.

Perkins, M., 1981, Personal interview between Dr. P.R. Davis, Wildlife Biologist, Dames & Moore, and Mr. M. Perkins, Wildlife Biologist, Bureau of Land Management, Ely, Nevada, June 23, 1981.

____, 1982, Personal interview between Dr. P.R. Davis, Wildlife Biologist, Dames & Moore and Mr. M. Perkins, Wildlife Biologist, Bureau of Land Management, Ely, Nevada, April 24, 1982.

Peterson, F.F., M.C. Fleischmann, and D.W. Bohmont, 1981, Landforms of the Basin and Range Province; Defined for soil surveys. SCS Technical Bull. 28, Soil Conservation Service, Washington, D.C.

Pister, E.P. 1980, Proceedings of the Desert Fish Council. Vol XI, Bishop, California.

Sada, D.W., 1982, Letter from Mr. D.W. Sada, Staff Ichthyologist, U.S. Fish and Wildlife Service, Reno, Nevada to Mr. R.E. Quinlan, Aquatic Biologist, Dames & Moore, August 2, 1982.

Schneider, P.B., and R. Turner, 1980, A survey of desert tortoise on selected areas in southern Nevada. Nevada Department of Wildlike, Reno, Nevada.

Snow, C., 1973, Habitat management series of endangered species. Southern bald eagle Haliaeetus leucocephalus alascanus. Bureau of Land Management, Techn. Rep. No. 5, T-N-171, Denver, Colorado.

______, 1974, Habitat management series for endangered and threatened species, ferruginous hawk (Buter ragalis). U.S. Bureau of Land Management, Tech. Rep. No. 13 T/N-255, Denver, Colorado.

Soil Conservation Services, 1964, Soils of the Western United States. Washington State University, Pullman, Washington.

______, 1965 (Revised 1972), Land resource regions and major land resource areas of the United States. Agriculture Handbook 296, Washington, D.C.

_____, 1975, Soil taxonomy - a basic system of soil classification for making and interpreting soil surveys. SCS Handbook 436, Washington, D.C.

_____, 1976, National Range Handbook. Soil Conservation Service, Washington, D.C.

_____, 1977, General vegetative map of White Pine County, Nevada. Soil Conservation Service MLRA D-28, Washington, D.C.

_____, 1981, Range Site Descriptions, Major Land Resource Area D-28. Technical Guide Section IIE. Soil Conservation Service, Washington, D.C.

_____, 1982, Ecological Site Descriptions, Draft Technical Guide Section IIE, Soil Conservation Service, Washington, D.C.

Stack, T., 1981, Stream habitat inventory, Schell Resource Area. Bureau of Land Management, Ely, Nevada.

State of Nevada, 1981, Identification of sensitive species of wildlife. Board of Wildlife Commissioners, Commission Policy No. 19, Reno, Nevada.

Stebbins, R.C., 1966, A field guide to western reptiles and amphibians. Houghton Mifflin Company, Boston, Massachusetts.

Sundstrom, L., W.G. Hepworth, and K.L. Diem, 1973, Abundance, distribution and food habitats of the pronghorn. Bulletin No. 12, Wyoming Game and Fish Department, Cheyenne, Wyoming.

Suminski, R., 1982, Telephone conversation between Mr. R.E. Quinlan, Aquatic Biologist, Dames & Moore and Ms. R. Suminski, Fishery Biologist, Bureau of Land Management, Ely, Nevada, July 13, 1982.

U.S. Department of the Interior, 1980a, Threatened and endangered wildlife and plants, review of plant taxa for listing as endangered or threatened species. Federal Register, 45 (242):82479-82509, December 15, U.S. Government Printing Office, Washington, D.C.

_____, 1980b, Endangered and threatened wildlife and plants. Federal Register 45 (99), May 20, 1980. U.S. Government Printing Office, Washington, D.C.

_____, 1982, Endangered and threatened wildlife and plants; Review of vertebrate wildlife for listing as endangered or threatened species. Federal Register, December 30, 1982, U.S. Government Office, Washington, D.C.

U.S. Geological Service, 1970, National Atlas. U.S. Department of the Interior, Washington, D.C.

Vigg, S., 1982, Ecology of the Nevadan relict dace, (Relictus solitarius) (Hubb and Miller) with a selected bibliography on Great Basin desert fishes. Bioresources Center Desert Research Institutes, Reno, Nevada, 110 pp.

Walstom, R.E., 1973, Water of Nevada, Forecasts for the future - Fish and Wildlife, Appendix D Inventory: Statistical data for the streams and lakes of Nevada. State Engineer's Office, Carson City, Nevada.

Whitaker, J.O., Jr., R. Elman, and C. Nehring, 1980, The Audubon Society Field Guide to North American Mammals. Alfred A. Knopf, New York.

Williams, J.E., and G.R. Wilde, 1981, Taxonomic status and morphology of isolate populations of the white river springfish, Crenichthys baileyi (Cyprinodontidae). The Southwest Naturalist 25 (4); 485-503.

10.0 GLOSSARY

Alkalinity - The relative concentrations of alkaline substances in water or soils sufficient to raise the pH value above 7.0 (alkaline).

Alluvial valley - Valley characterized by stream deposits from surrounding or adjacent mountain ranges.

Basins - Generally the valley between mountain ranges or areas receiving drainage from surrounding areas.

Benches - Level topographic feature characteristic of valley slopes; usually a remnant of prehistoric water bodies or wind-blown deposits.

Biological diversity - Numerous diverse living organisms together compiling a complex in which each organismal type has a role or occupies a niche, thereby sustaining balance throughout the biological community.

Carrying capacity - The maximum number of individuals a given area can satisfactorily accommodate primarily determined by the availability of food and the presence of shelter and breeding sites.

Ecosystem - The complex of a community and its environment functioning as an ecological unit in nature.

Erosion hazard - The degree of a soil's susceptibility to accelerated erosion. Wind erosion hazards are classed as High, Moderate and Low water erosion. Classes are numerically rated into four graduations from 0 to 1.0 with 1 being the highest hazard.

Fan - Soil deposited into main valleys from mountain-originated streams.

Fan skirt alluvial flat - A major land form comprised of laterally coalescing, small alluvial fans that issue from gullies cut into, or are extensions of inset fans that merge with the valley floor.

Fan piedmont - A major landform of most piedmont slopes formed by the lateral coalescence of mountain front alluvial fans into a smooth slope.

Fecal pellet group - A deposition of feces in the form of pellets. The occurrence of such depositions indicates the respective species that frequent the area.

Flats - The lower, nearly level area of a valley.

Floodplain - Nearly level land situated on either side of a channel which is subject to overflow flooding.

Foliar cover - The surface area of ground occupied by a species, structural class or total vegetation; vertical projection of the crown or shoot area of a species to the ground surface expressed as a fraction or percent of a referenced area.

Graminoid - Having a grass or grass-like life form.

Great Basin Physiographic Province - Part of the Rocky Mountain/Sierra Nevada intermountain area which lies west of the Colorado Plateau and extends to the Sierra Nevada Mountains.

Grouse booming - Male grouse behavior during courtship. This reproductive behavior is identified by the mall puffing its white chest, exposing yellow air sacs on its neck, and erecting and spreading its pointed tail feathers. During this display, the male grouse will emit a popping sound.

Halophytic - Plants characteristically tolerant of saline soils or substrates.

Hydric meadow - Vegetation formed by grass species with water at or near the surface.

Hydrophytic - Plants characteristically of and requiring wet habitats.

Important species - Species that characterize an ecosystem or plant community; species because of size or other features have the most influence on community structure and composition.

Inset fans - A special case of a floodplain of an ephemeral stream that is confined between fan remnants, basin floor remnants, or closely opposed fan toe slopes.

Lek - An assembly area where grouse carry on display and courtship behavior.

Noxious weeds - Plant species that have the potential to cause economic loss via toxicity or mechanical injury to livestock or reduction in agricultural productivity.

Pediment - An erosional surface that lies at the foot of a receded slope.

Perennial stream - A stream which flows continually.

Playa - An area of internal drainage characterized by saline soils and salt-tolerant plant species.

Pleistocene - The glacial epoch within the early Quaternary period beginning approximately one million years ago.

Potential Native Community - The plant community that would develop in response to climate and soil conditions in the absence of disturbance, thus culminating in a stable assemblage of plant species.

Production (annual) - The amount of plant material (above ground) produced in one year, usually measured as dry weight per unit area.

Raptor - A bird of prey.

Salinity - The relative concentration of salts, usually sodium chloride, commonly expressed as parts per million.

Sensitive species - Species that may be extirpated from their habitat; includes rare, threatened or endangered species, and those prone to be intolerant of disturbance.

Shorebirds - A variety of wading birds usually frequenting marshes, wet meadows, streamsides and shores of ponds and lakes.

Soil mapping units - A delineated area on a map that contains a single soil type and phase or an association of soil types and phases.

Soil permeability - The quality of a soil horizon that enables water or air to move through it.

Soil series - The basic unit of soil classification where soils are separated on the basis of similar profile characteristics and assigned a nationally approved name.

Soil stratum - A layer of soil formed by the processes of arrangement, composition or deposition of soil materials.

Spring head - A groundwater source penetrating the earth's surface to give origin to a stream.

Summer range - A relatively higher elevational area utilized during summer by a seasonally migratory specie usually providing seclusion for birthing and escape from summer temperatures.

Terrace - Component of river valleys and formed during times of high flow, parallel to the active channel.

Third order soil survey - Soil survey applicable for general planning of county or multi-county planning districts and planning areas of extensive uses such as some rangelands and arid land.

Threatened or endangered species - Any species which is likely to become or is in danger of extinction throughout all or a significant portion of its range.

U.S. Standard Soil Taxonomy - A standardized soil classification system with guidelines established in U.S.D.A. Agricultural Handbook 436. "Soil Taxonomy".

Vegetation zonation - Homogeneous vegetation cover found in a specified geographic region or area which has a uniform microclimate; often associated with distinct vegetation changes according to elevation.

Water table - The upper surface of a saturated zone, where the body of ground water is not confined by an overlying body of groundwater.

Wetlands - Lands where saturation by water is the dominant factor determining the nature of soil development and the types of plant and animals living in the soil and on its surface; includes marshes, swamps and bogs.

Winter range - A relatively lower elevational area utilized during winter by a seasonally migratory specie and usually providing refuge from adverse winter elements and greater access to food.

Xeric - The dry class of the hygrotopic scale used to generally characterize habitats; xeric = dry, mesic = optimal, hydric = wet.

TABLES

Table 2-1

Aerial and Ground Reconnaissance Schedule

Site	Type of Reconnaissance	
	Aerial	Ground
Butte Valley	23 April 1982	22 June 1981 23 April 1982 26 April 1982
North Steptoe Valley	25 April 1981	19 June 1981 25 April 1982 28 April 1982
Spring Valley	24 April 1982	20 June 1981 24 April 1982 27 April 1982

Table 3-1

Soils Classification

- ARIDISOLS
  - Argids
    - Nadurargids
      - Haplic nadurargids
        - Fine-montmorillonitic, mesic
          - Riepe
  - Orthids
    - Calciorthids
      - Typic Calciorthids
        - Loamy-skeletal, carbonatic, mesic
          - Dera
        - Fine-loamy, mixed, mesic
          - Stimca
      - Aquic calciorthids
        - Fine-silty, carbonatic, mesic
          - Duffer
      - Xerollic calciorthids
        - Loamy-skeletal, carbonatic, mesic
          - Sanpete
    - Camborthids
      - Typic camborthids
        - Coarse-loamy, mixed, mesic
          - Lusetti
        - Fine-loamy, mixed, mesic
          - Raph
      - Aquic camborthids
        - Fine-loamy, mixed, mesic
          - Uwell
      - Xerollic camborthids
        - Coarse-loamy, mixed, mesic
          - Blimo
        - Fine-montmorillonitic, mesic
          - UN-One
        - Fine-loamy, mixed, mesic
          - Uwell
    - Durothids
      - Xerollic durothids
        - Coarse-loamy, mixed, mesic
          - Oupico
        - Loamy-skeletal, carbonatic, mesic, shallow
          - Ursine
- INCEPTISOLS
  - Halaquepts
    - Typic halaquepts
      - Fine, carbonatic, mesic
        - Equis
  - Haplaquepts
    - Typic haplaquepts
      - Clayey over loamy, montmorillonitic, mesic
        - Boofus
- MOLLISOLS
  - Calcixerolls
    - Aridic calcixerolls
      - Loamy-skeletal, carbonatic, frigid
        - Fontreen
  - Haploxerolls
    - Lithic Haploxerolls
      - Loamy-skeletal, carbonatic, frigid
        - Hymas

Table 3-2

Noxious and Injurious Weeds[a]

Common Name	Scientific Name
Noxious Weeds	
Arrowgrass[b]	*Triglochin maritima*
Austrian fieldcress	*Rorippa austriaca*
Austrian peaweed	*Sphaerophysa salsula* *Swainsona salsula*
Camelthorn	*Alhagi camelorum*
Klamath weed	*Hypericum perforatum*
Hemlock	
Poison	*Conium maculatum*
Water	*Cicuta douglasii*
Horsenettle	
Carolina	*Solanum carolinense*
White	*S. elaeagnifolium*
Knapweed	
Diffuse	*Centaurea diffusa*
Russian	*C. repens*
Leafy spurge	*Eurphorbia esula*
Licorice	*Glycyrrhiza lepidota*
Mediterranean sage	*Salvia aethiopis*
Medusahead	*Elymus caput-medusae* *Taeniatherum asperum*
Puncturevine	*Tribulus terrestris*
Sorghum species, perennial	*Sorghum* spp.
Johnsongrass	*Sorghum almun*
Thistle	
Canada	*Cirsium arvense*
Musk	*Carduus nutans*
Scotch	*Onopordum acanthium*
Sow	*Sonchus arvensis*
Iberian star	*Centaurea iberica*
Purple	*C. calcitrapa*
Yellow star	*C. solstitialis*
Toadflax, dalmatian	*Linaria dalmatica*
Whitetop/hoary cress	*Cardaria draba*, *C. pubescens* *Lepidium latifolium* *L. repens*
Injurious Weeds	
Bindweed, field	*Convolulus arvensis*
Buffalo-bur	*Solanum rostratum*
Burdock	*Arctium minus*
Dodder	*Cuscuta* spp.
Dogbane	*Apocynum cannabinum*
Halogeton	*Halogeton glomeratus*
Iris, wild	*Iris* spp.
Larkspur	*Delphinium* spp.
Povertyweed	*Iva axillaris*
Quackgrass	*Agropyron repens*
Rue, African	*Peganum harmala*
Russian thistle	*Salsola pestifer*
Sandbur	*Cenchrus pauciflorus*
Tansey ragwort	*Senecio jacobaea*
Saltceder	*Tamarix* spp.

---

[a] According to Nevada Revised Statutes, Section 555.130 to 555.200.

[b] Not listed by Nevada but is known to have toxic or injurious properties.

Table 3-3

Relict Dace Habitat[a]

Valley	Habitat	Location (Township, Range)	Occurrence (E-Exists, A-Absent)
Spring	Spring Valley Creek	T23N,R66E	E[b,c]
	Stone House	T22N,R66E	E[b,c]
	Keegan Ranch	T18N,R66E	E[b,c]
	Shoshone Ponds	T12N,R67E	E[b,c]
Steptoe	Cardano Ranch Springs	T25N,R64E	E[b,d]
	Warm Springs Station	T21N,R63E	A[b,d] (currently probable)
	Steptoe Ranch Springs	T19N,R63E	E[b,d]
	Steptoe Ranch Springs Slough	T19N,R63E	A[e]
	Grass Springs	T19N,R63E	E[d] (one spring pond)
	Dairy Ranch Springs	T18N,R64E	E[b] (only one specimen)
	Georgetown Ranch	T16N,R63E	A[e]
	Ruth Pond	T16N,R62E	E[b,c]
	3C Ranch	T15N,R64E	E[e]
	Murphy Ranch	T25N,R64E	A
Butte	Atwood Ranch	T29N,R62E	E[b,d]
	Tributary to Butte Creek	T28N,R61E	E[b,d]
	Head of Odgers Creek	T27N,R62E	E
	Odgers Creek	T28N,R61E	E[b]
	Stratton Ranch	T26N,R62E	A[b] (currently probable)
	Wrights Spring	T26N,R62E	A[b] (currently probable)
	Owens Ranch	T26N,R62E	E[b]

---

[a] Adapted from Vigg (1982)

[b] Documented by Hardy (1979)

[c] Introduced populations (1982)

[d] Documented by Vigg (29)

[e] Documented by Hubbs, et al. (1974)

Table 3-4

Aquatic Species and Habitats

Species	Habitat	Location (Township, Range, Section)
White River spinedace	Arnoldsen Spring	T12N R61E S2
	Cold Spring	T12N R61E S12
	Lund Town Spring	T11N R61E S34
	Nicholas Spring	T12N R61E S12
White River desert sucker	Arnoldsen Spring	T12N R61E S2
	Lund Town Spring	T11N R61E S34
	Preston Big Spring	T12N R61E S2
White River speckled dace	Lund Town Spring	T11N R61E S34
	Preston Big Spring	T12N R61E S2
Preston White River springfish	Arnoldsen Spring	T12N R61E S2
	Cold Spring	T12N R61E S12
	Indian Spring	T12N R61E S2
	Lund Town Spring	T11N R61E S34
	Nicholas Spring	T12N R61E S12
	Preston Big Spring	T12N R61E S2
	Preston Town Spring	T12N R61E S12
White River springfish	Hot Creek Spring	T6N R61E S17
	Moon Ranch Spring	T6N R60E S25
	Moorman Spring	T9N R61E S31
Clover Valley speckled dace	Spring Pond and outflow 9.5 miles south of Wells, Nevada.	T36N R62E[a] near corners of sections 19-20 and 29-30
	Warm Springs	T33N R61E S7[a]
Independence Valley speckled dace	Warm Springs	see note below[b]
Independence Valley Tui Chub	Warm Springs	see note below[b]
Meadow Valley Wash desert sucker	Perennial waters	Condor Canyon[c]
Big Springs spinedace	Perennial waters	Condor Canyon[c]
Meadow Valley Wash speckled dace	Perennial waters	Meadow Valley Wash

Sources:

[a] Hubbs, et al., 1974

[b] Warm Springs of Independence Valley - "West margin of the north arm of the valley just off the base of the Pequop Mountains, approximately on the edge of the bed of pluvial Lake Clover just below the 5700 ft. contour on either side of the T35N/T36N line near middle of R66E" (Hubbs, et al., 1974).

[c] Allen, 1983

Adapted from Pister (1980).

Table 4-1

Dominant Soil Properties

Soil Mapping Unit	Soil Depth	Physiographic Position	Soil Drainage Class	Permeability	Available Water Capacity	Erosion Hazard
101, 102	---	Playas, Ore Dumps				High
201, 215	Shallow	Alluvial fans	Well	Moderate	Low	Moderate
202	Deep	Alluvial fans, terraces	Well	Moderate to moderate rapid	High	Slight
203	Deep	Alluvial fans	Well	Moderate	Moderate to high	Moderate
204	Deep	Alluvial fans, terraces	Well	Moderate	High	Moderate
211	Deep	Basin-filled plains	Well	Moderate rapid to moderate slow	Moderate to high	Slight
212	Deep	Basin-filled plains	Well	Moderate slow to moderate rapid	High	Slight
213	Deep	Basin-filled plains	Well to Moderate Well	Slow to moderate slow	Moderate	Slight
214	Deep	Basin-filled plains	Well	Moderate slow to moderate	High	Slight
216	Shallow	Alluvial fans	Well	Moderate rapid	Low	Moderate
217	Shallow	Alluvial fans	Well	Moderate rapid	Low to high	Moderate
218	Shallow	Alluvial fans	Well	Moderate rapid to moderate	Low to moderate	Moderate
219	Shallow	Alluvial fans	Well	Moderate rapid to moderate	Low to moderate	Moderate to slight
220	Deep	Basin-filled plains floodplains	Somewhat poorly to well	Slow to moderate	High	Low to moderate
301-302	Deep	Basin-filled plains, floodplains	Somewhat poorly to well	Moderate to slow	Moderate to high	Moderate to slight
206, 501, 502, 503, 504, 505, 511	Shallow to Moderate	Mountain slopes, valleys, foothills	Well	Moderate to moderate rapid	Low to high	Moderate

Table 4-2

Soils and Ecological Sites
White Pine County

Mapping Unit	Soil Series	SCS Ecological Site Number	Ecological Site	Precipitation Zone	Range in Production Pounds/Acre Air Dry Potential	Median[a]
1500	Blimo	028B010N	Loamy	8-10	400-800	600
1480	Boofus	028B020N	Sodic Flat	5-12	200-600	450
1080	Dera	028B017N	Loamy	5-8	250-700	450
1480	Duffer, Flooded	028B002N	Saline Meadow	5-12	750-3000	1500
1480	Equis	028B004N	Saline Bottom	5-12	500-2000	1000
2110	Fontreen	028B060N	Shallow Loamy Slope	12-16	100-600	300
2110	Hyzen	028B060N	Shallow Loamy Slope	12-16	100-600	300
2180	Lusetti	028B013N	Silty	8-10	300-800	550
1042	Oupico	028B010N	Loamy	8-10	400-800	600
1500	Raph	028B017N	Loamy	5-8	250-700	450
1840	Riepe	024X003N	Sodic Terrace	6-8	300-600	450
1040	Sanpete	028B010N	Loamy	8-10	400-800	600
1840	Stimca	024X022N	Sodic Terrace	8-10	350-800	600
2140	Ursine	028B011N	Shallow Calcareous Loam	8-12	400-950	700
1011	UN-one	024X022N	Sodic Terrace	8-10	350-800	600
1500	Uwell	028B010N	Loamy	8-10	400-800	600
2261	UN-three	028B004N	Saline Bottom	5-12	500-2000	1000

---

[a] Soil Conservation Service median values were used when available, otherwise, high and low values were averaged.

Table 4-3

Site Acreage

Ecological Site	Butte Valley Site Acres	North Steptoe Valley Site Acres	Spring Valley Site Acres
Loamy 8-10	860	110	500
Shallow Calcareous Loam 8-12	443	--	1055
Silty 8-10	344	--	825
Loamy 5-8	833	744	--
Sodic Terrace 6-8	--	755	--
Sodic Terrace 8-10	--	619	--
Other[a]	--	22	--
Total	2480	2250	2380

---

[a] Saline Meadow 5-12, Saline Bottom 5-12, Sodic Flat 5-12.

Table 8-1

Candidate Threatened and Endangered Plant Species

Scientific Name	Common Name	Status[a]	County	Habitat
A. calycocus var. *monophyllidius*	Oneleaf Torrey milkvetch	2, 3a (T)	Nye, Lincoln	Open gravelly, limestone hillsides. Pinyon-juniper, big sagebrush. Elevation 5600 to 7000 feet.
A. nyensis	Nye milkvetch	2, 3b	Clark, Lincoln	Outwash fans and gravelly flats, sometimes in sandy soil. Associated with creosote bush, black brush, bursage, range ratany. Elevation 1700 to 5600 feet.
Castilleja salsuginosa	Monte Neva paintbrush	3a (E), 4	White Pine	Occurs only at Monte Neva Hot Springs; wet saline clay soil, on hummocks and sides of shallow washes draining mineral springs.
Coryphantha vivipara var. *rosea*	Clokey pincushion cactus	1, 3b (T)	White Pine, Lincoln, Nye	Gravelly limestone or volcanic slopes and brushy hillsides. Pinyon-juniper, black sagebrush communities. Elevation 3800 to 9000 feet.
Draba sphaeroides var. *cusickii*	Draba	2, 3c	White Pine, Nye	Rocky outcrops, pinyon-juniper, Great Basin coniferous forest.
Eriogonum darrovii	Darrow buckwheat	2, 3c	Elko, White Pine	Very hard, dry, fine soil with limestone, in washes and flats. Associated plants: Utah juniper, low rabbitbrush, big sagebrush, tufted rockmat, Stansbury cliffrose. Elevation 6100 to 6500 feet.
Frasera gypsicola	Sunnyside green gentran	3 (E), 4	Nye	Fine self-rising soil, encrusted with salts. Associated plants: gentian, big sagebrush, desert plume, whitemargin frasera, pepperweed. Elevation 4950 to 5200 feet.
Lepidium nanuum	Lepidium	2, 3b	White Pine, Elko, Lincoln	Barren knolls, low sagebrush.
Lesquerella hitchcockii	Hitchcock bladderpod	2, 3b-3c(?)	White Pine, Nye	Loose limestone, rocky, gravelly soils, talus slopes. With singleleaf pinyon, ponderosa pine, bristlecone pine, white fir, black sagebrush. Elevation 7000 to 11,500 feet.
Mirabilus pudica	--	2, 3c	Clark, Lincoln	Shadscale, creosote bush, disturbed sites.
Penstemon bicolor ssp. *bicolor*	Bicolored penstemon	1, 3a (T)	Clark	On slight elevations in shallow, gravelly washes and on roadsides. Associated with creosote bush and yucca. Elevation 1970 to 5480 feet.

Table 8-1 (continued)

Scientific Name	Common Name	Status[a]	County	Habitat
P. bicolor ssp. roseus	Bicolored penstemon	1, 3a (T)	Clark	On slight elevations in shallow, gravelly washes and on roadsides. Associated with cresotoe bush and yucca. Elevation 1970 to 5480 feet.
Perityle megalocephala var. intricata	Perityle	2, 3b	Nye, Clark	Shadscale.
Phacelia anelsonii	A. nelson phacelia	2, 3b (T)	Clark, Lincoln	Shaded places, rich soil at base of limestone cliffs, or among rocks of sandy and gravelly washes. Associated with Utah juniper, dory sage and oak brush.
P. parishii	Parish phacelia	2, 3b	Lincoln, Nye	Big sagebrush, greasewood-saltwood.
Sclerocactus pubispinus	Great Basin fishhook cactus	1, 3a (T)	White Pine, Elko, Lincoln	Rocky dolomite or quartzite soil. Associated plants: sagebrush, pinyon-juniper, and Atriplex spp. Elevation 5000 to 6000 feet.
Thelypodium laxiflorum	Thelypody	1, 3c	Lincoln	Big sagebrush, pinyon-juniper.
T. sagittatum var. ovalifolium	Oval leaf thelypody	1, 3b (T)	Elko, White Pine, Nye	Clay soils, by springs, streams or lakes endemic to White Pine County. With basin wildrye, California slim nettle, Nevada goldenrod, burdock, willow. Elevation 6000 to 8400 feet.
Zigadenus vaginatus	Camus	1, 3b	White Pine	Geothermal areas. With greasewood-saltbrush.

---

[a] Status:
1 = Nevada "watch list," Nevada Rare, Threatened, and Endangered Workshop, February, 1983, or Mozingo and Williams, 1980.
2 = Nevada Rare, Threatened, and Endangered Workshop, February 1983.
3 = Candidate taxa under review by USFWS.
  a = Taxa with sufficient information to support their being listed as threatened/endangered.
  b = Taxa with information indicating probable appropriateness for listing as threatened/endangered, but where additional data are needed to support such listing.
  c = Taxa no longer being considered for listing.
  T = Threatened.
  E = Endangered.
4 = Recognized as threatened or endangered by Nevada Division of Forestry, protected by NRS 527.270.

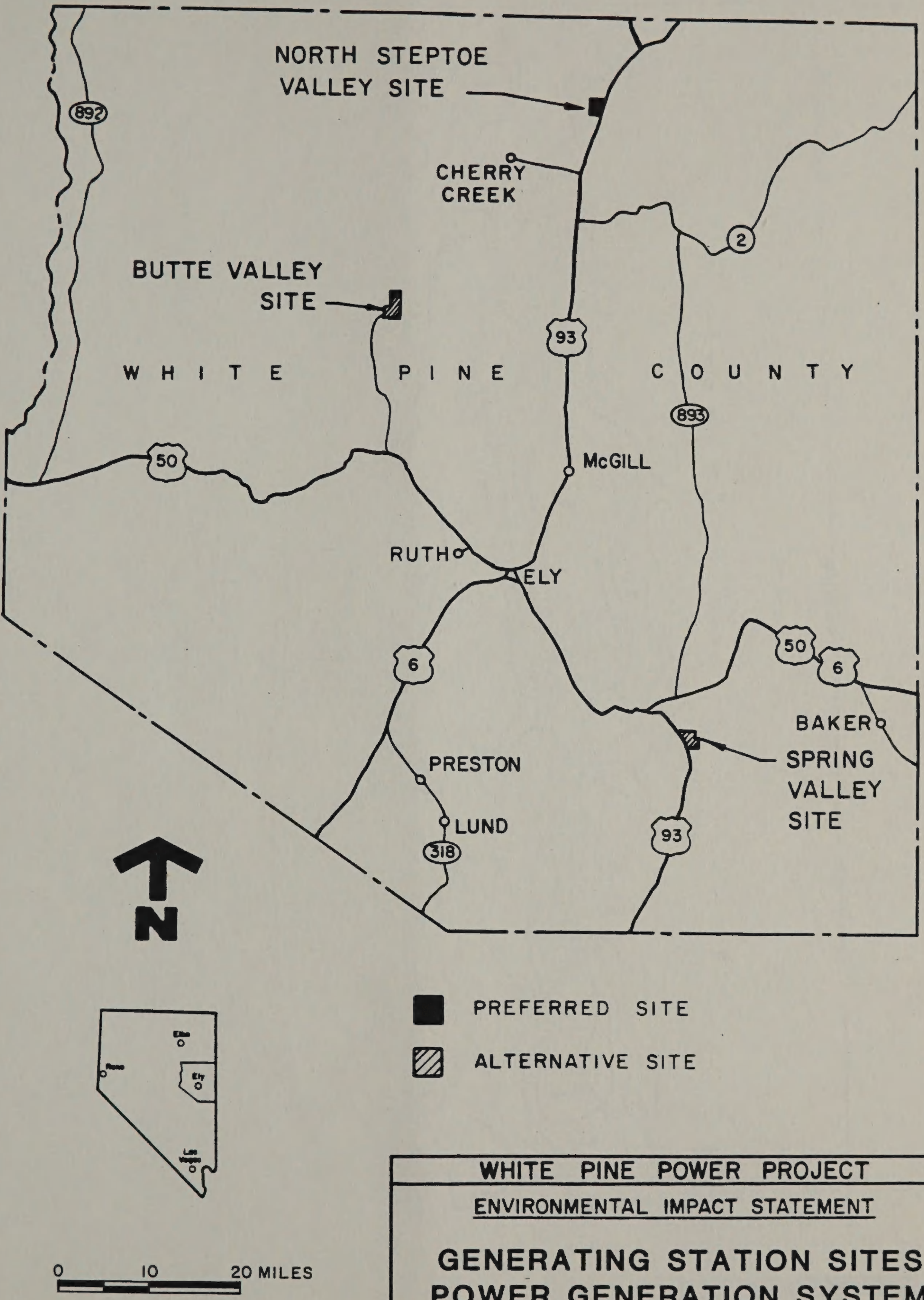
Sources: Mozingo, H. N., and Margaret Williams. Threatened and Endangered Plants of Nevada; An Illustrated Manual. U.S. Fish & Wildlife Service, Portland, Oregon, and U.S. Bureau of Land Management, Reno, Nevada, 1980.

Sensitive Plant List for Nevada. Threatened and Endangered Workshop, November, 1981.

Department of the Interior. U.S. Fish & Wildlife Service. Endangered and Threatened Wildlife and Plants; Review of Plant Taxa for Listing as Endangered or Threatened Species. Federal Reg. 45:242, pp. 82480-82569, 1980.

Nevada State Museum, Carson City, NV, Nevada Threatened and Endangered Plant Workshop, February 1983.

FIGURES

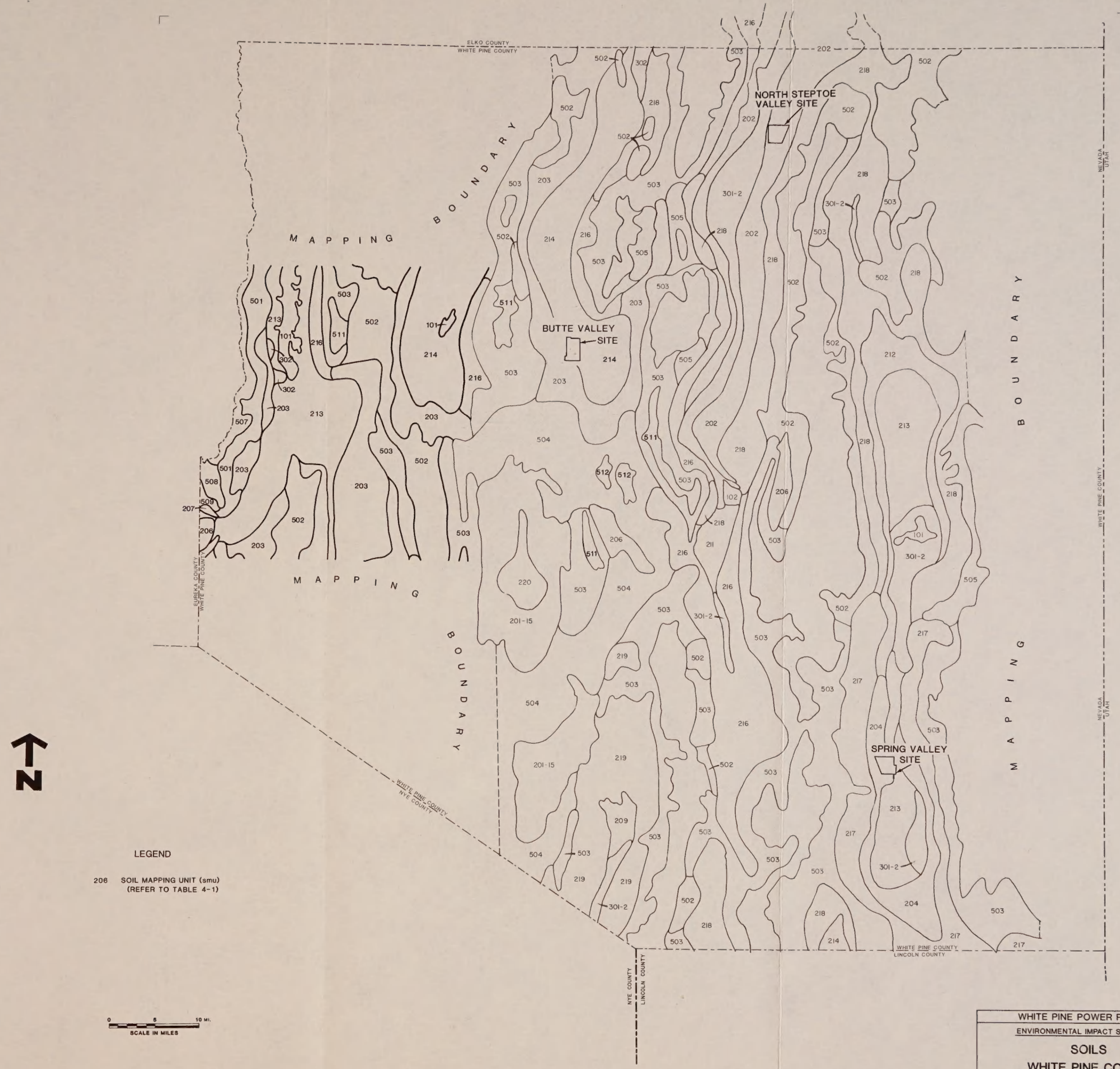


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

GENERATING STATION SITES
POWER GENERATION SYSTEM

FIGURE 1-1



LEGEND

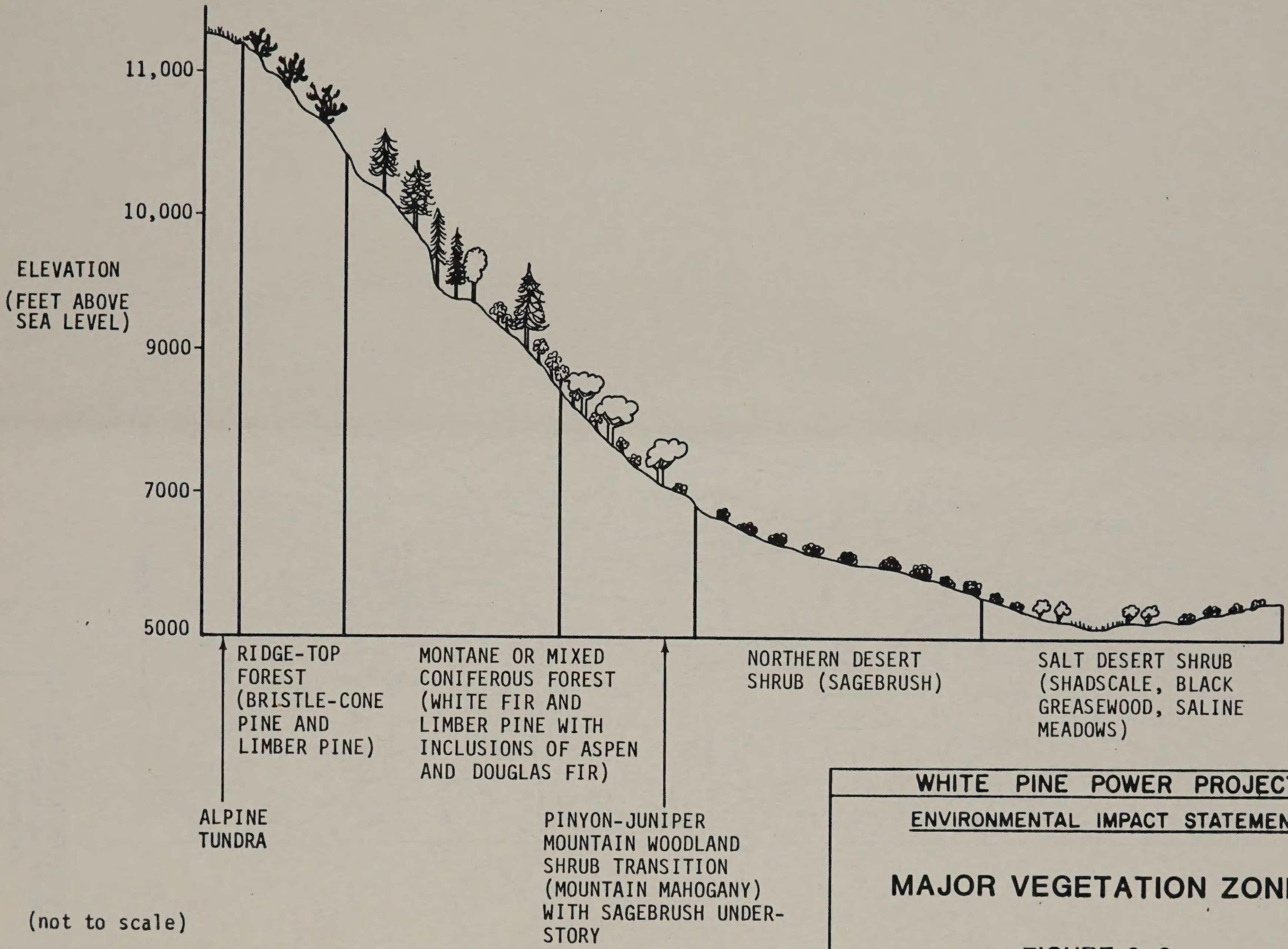
206 SOIL MAPPING UNIT (smu)
(REFER TO TABLE 4-1)

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

SOILS
WHITE PINE COUNTY

FIGURE 3-1

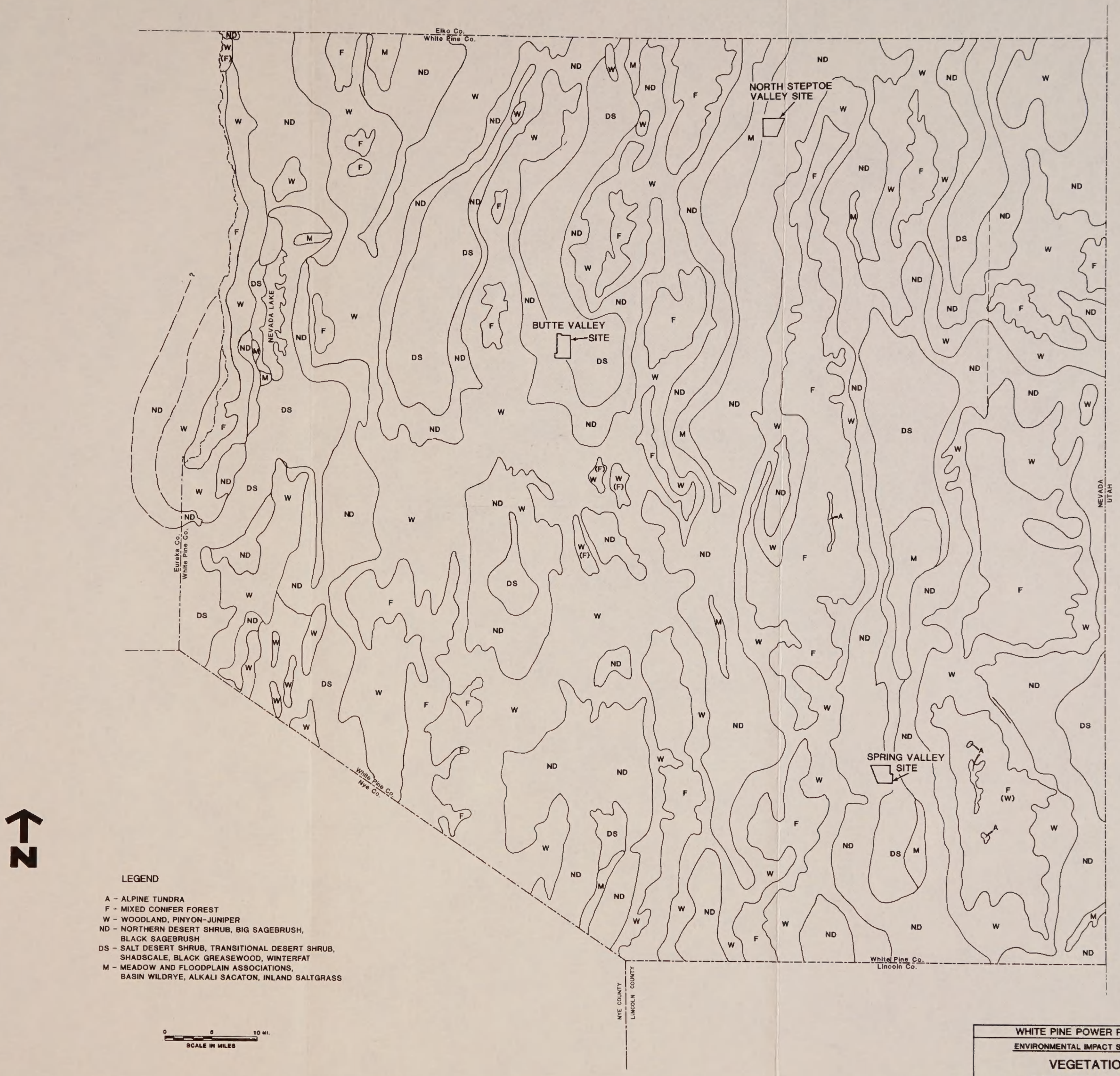

ELEVATION (FEET ABOVE SEA LEVEL)
11,000
10,000
9000
7000
5000
ALPINE TUNDRA
RIDGE-TOP FOREST (BRISTLE-CONE PINE AND LIMBER PINE)
MONTANE OR MIXED CONIFEROUS FOREST (WHITE FIR AND LIMBER PINE WITH INCLUSIONS OF ASPEN AND DOUGLAS FIR)
PINYON-JUNIPER MOUNTAIN WOODLAND SHRUB TRANSITION (MOUNTAIN MAHOGANY) WITH SAGEBRUSH UNDERSTORY
NORTHERN DESERT SHRUB (SAGEBRUSH)
SALT DESERT SHRUB (SHADSCALE, BLACK GREASEWOOD, SALINE MEADOWS)
(not to scale)

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

MAJOR VEGETATION ZONES

FIGURE 3-2



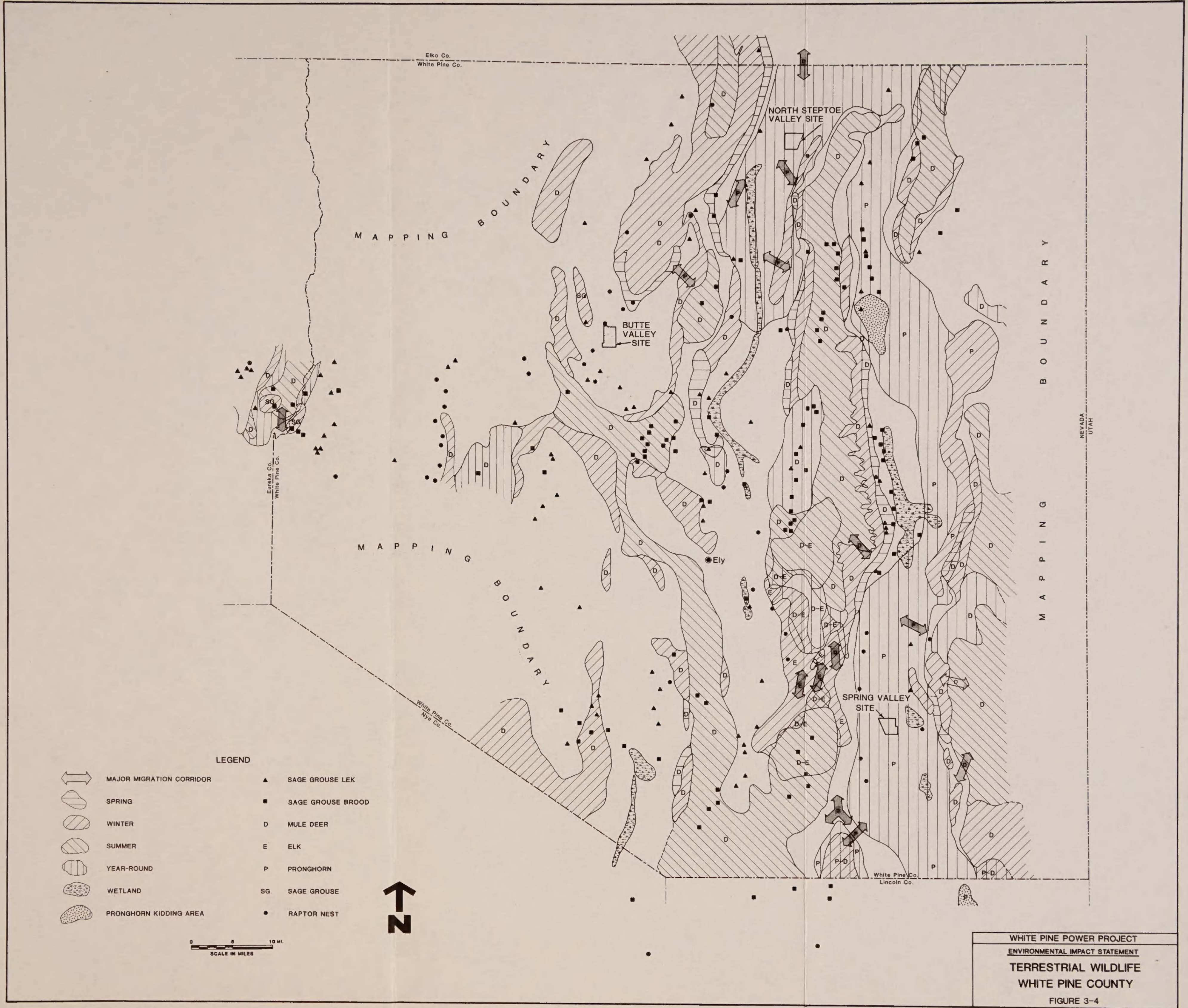
LEGEND

A - ALPINE TUNDRA
F - MIXED CONIFER FOREST
W - WOODLAND, PINYON-JUNIPER
ND - NORTHERN DESERT SHRUB, BIG SAGEBRUSH, BLACK SAGEBRUSH
DS - SALT DESERT SHRUB, TRANSITIONAL DESERT SHRUB, SHADSCALE, BLACK GREASEWOOD, WINTERFAT
M - MEADOW AND FLOODPLAIN ASSOCIATIONS, BASIN WILDRYE, ALKALI SACATON, INLAND SALTGRASS

WHITE PINE POWER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

VEGETATION
WHITE PINE COUNTY

FIGURE 3-3

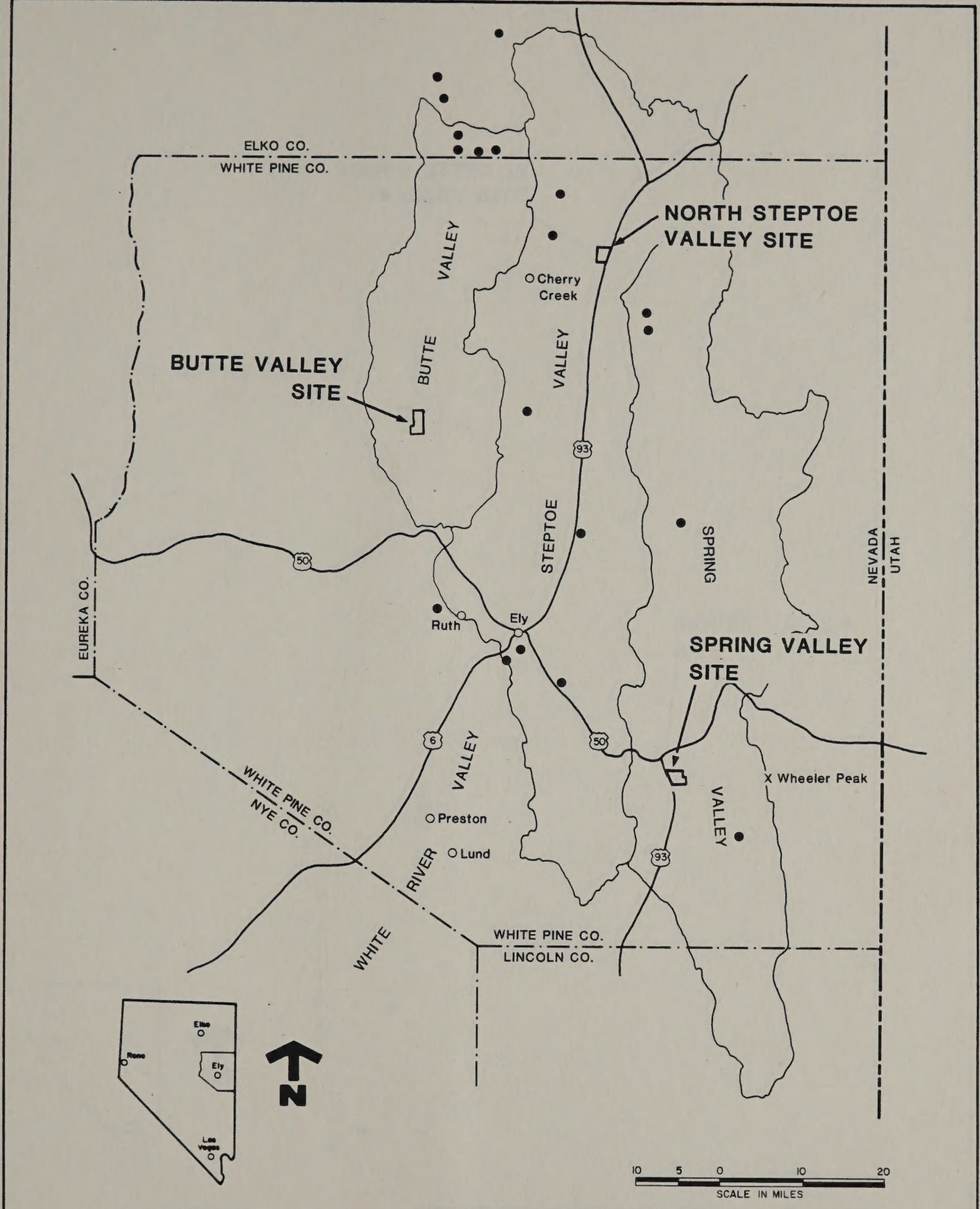


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

TERRESTRIAL WILDLIFE
WHITE PINE COUNTY

FIGURE 3-4



LEGEND

▨ GENERATING STATION SITES

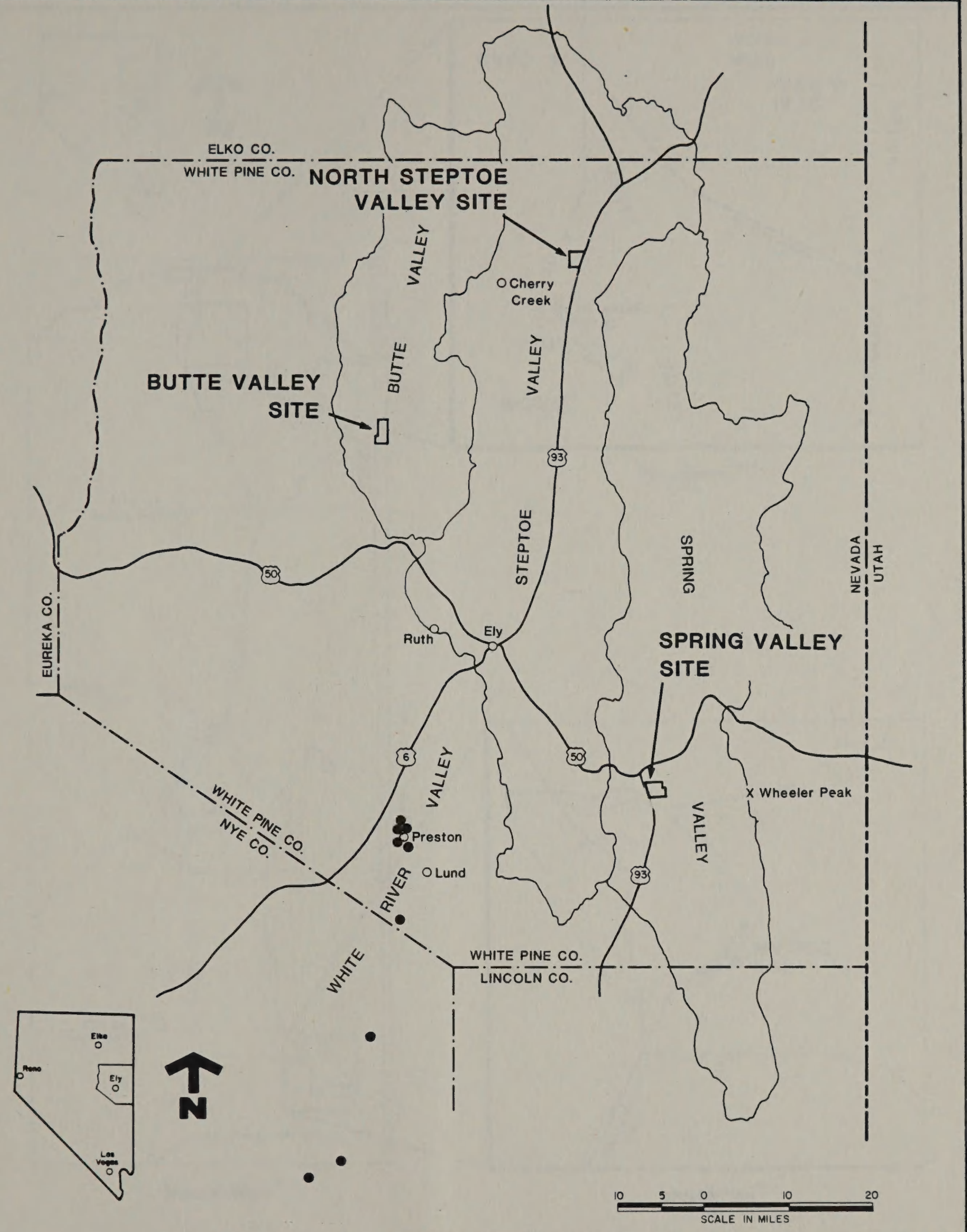
● RELICT DACE HABITAT

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

DISTRIBUTION OF RELICT DACE HABITAT

FIGURE 3-5



LEGEND

▦ GENERATING STATION SITES

● SPRINGS INHABITED BY:

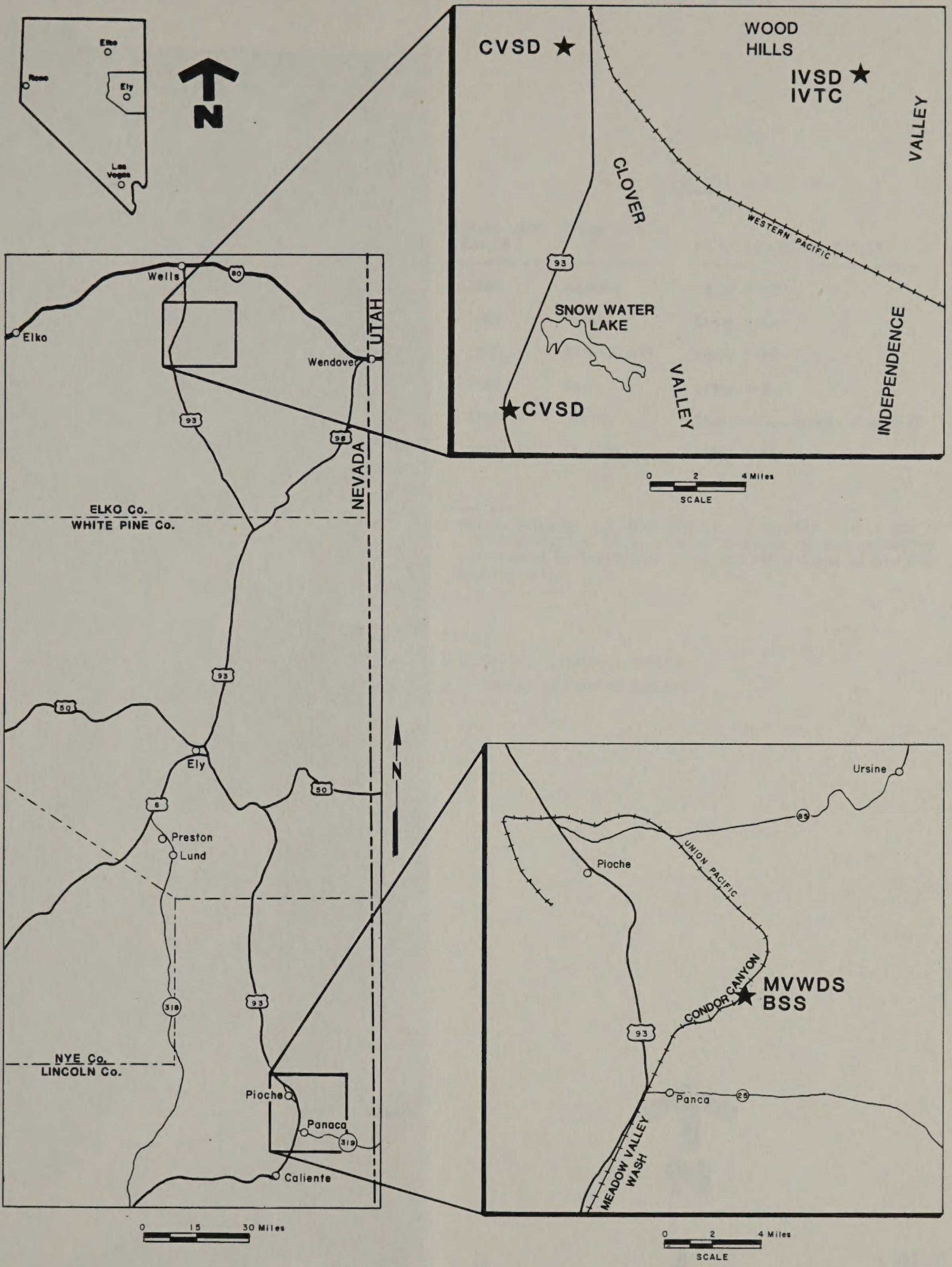
WHITE RIVER DESERT SUCKER
WHITE RIVER SPINEDACE
WHITE RIVER SPRINGFISH
WHITE RIVER SPECKLED DACE

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

DISTRIBUTION OF DESERT FISH SPECIES WHITE RIVER VALLEY

FIGURE 3-6



LEGEND

CVSD - CLOVER VALLEY SPECKLED DACE

IVSD - INDEPENDENCE VALLEY SPECKLED DACE

IVTC - INDEPENDENCE VALLEY TUI CHUB

MVWDS - MEADOW VALLEY WASH DESERT SUCKER

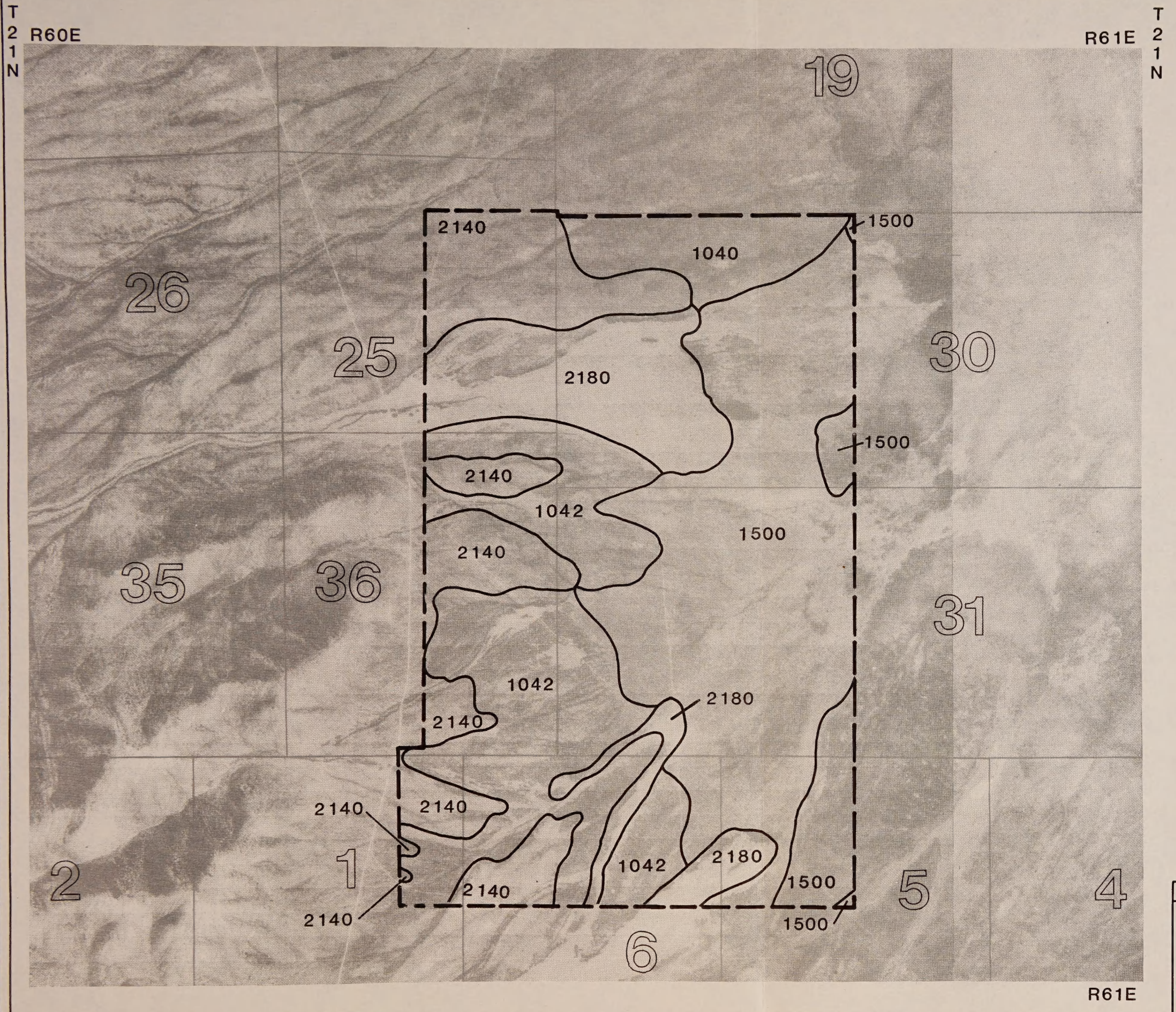
BSS - BIG SPRINGS SPINEDACE

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

DISTRIBUTION OF DESERT FISH SPECIES

FIGURE 3-7



LEGEND

MAPPING UNIT NUMBER	MAJOR SOIL SERIES	MAJOR ECOLOGICAL SITES[a]
1040	Sanpete	Loamy 8-10
1042	Oupico	Loamy 8-10
1500	Blimo-Uwell	Loamy 8-10
1500	Raph	Loamy 5-8
2140	Ursine	Shallow Calcareous Loam 8-12
2180	Lusetti	Silty 8-10

---

a Unless noted by (%), over 80% of the mapping unit is the listed ecological site. The percentages are the estimated occurrences of ecological sites and other lands within the mapping unit.

Source:

U.S. Soil Conservation Service

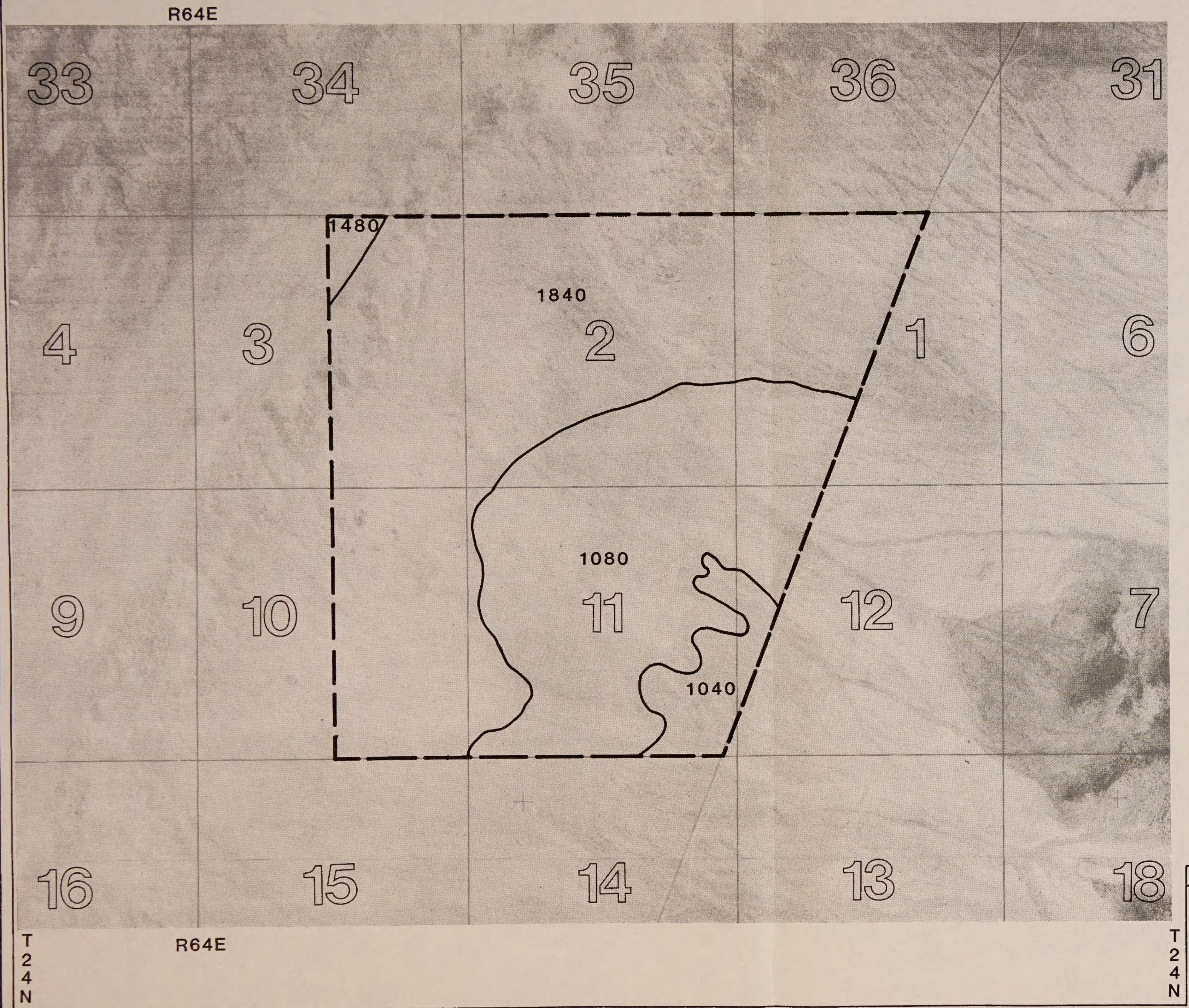
U.S. Bureau of Land Management

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

SOILS AND ECOLOGICAL SITES
BUTTE VALLEY SITE

FIGURE 4-1



LEGEND

MAPPING UNIT NUMBER	MAJOR SOIL SERIES	MAJOR ECOLOGICAL SITES[a]
1040	Sanpete	Loamy 8-10
1080	Dera	Loamy 5-8
1480	Duffer, Flooded	Saline Meadow 5-12 (20%)
1480	Equis	Saline Bottom 5-12 (30%)
1480	Boofus	Sodic Flat 5-12 (40%)
1840	Riepe	Sodic Terrace 6-8 (45%)
1840	Stimca	Sodic Terrace 8-10 (40%)

---

a Unless noted by (%), over 80% of the mapping unit is the listed ecological site. The percentages are the estimated occurrences of ecological sites and other lands within the mapping unit.

Source:

U.S. Soil Conservation Service

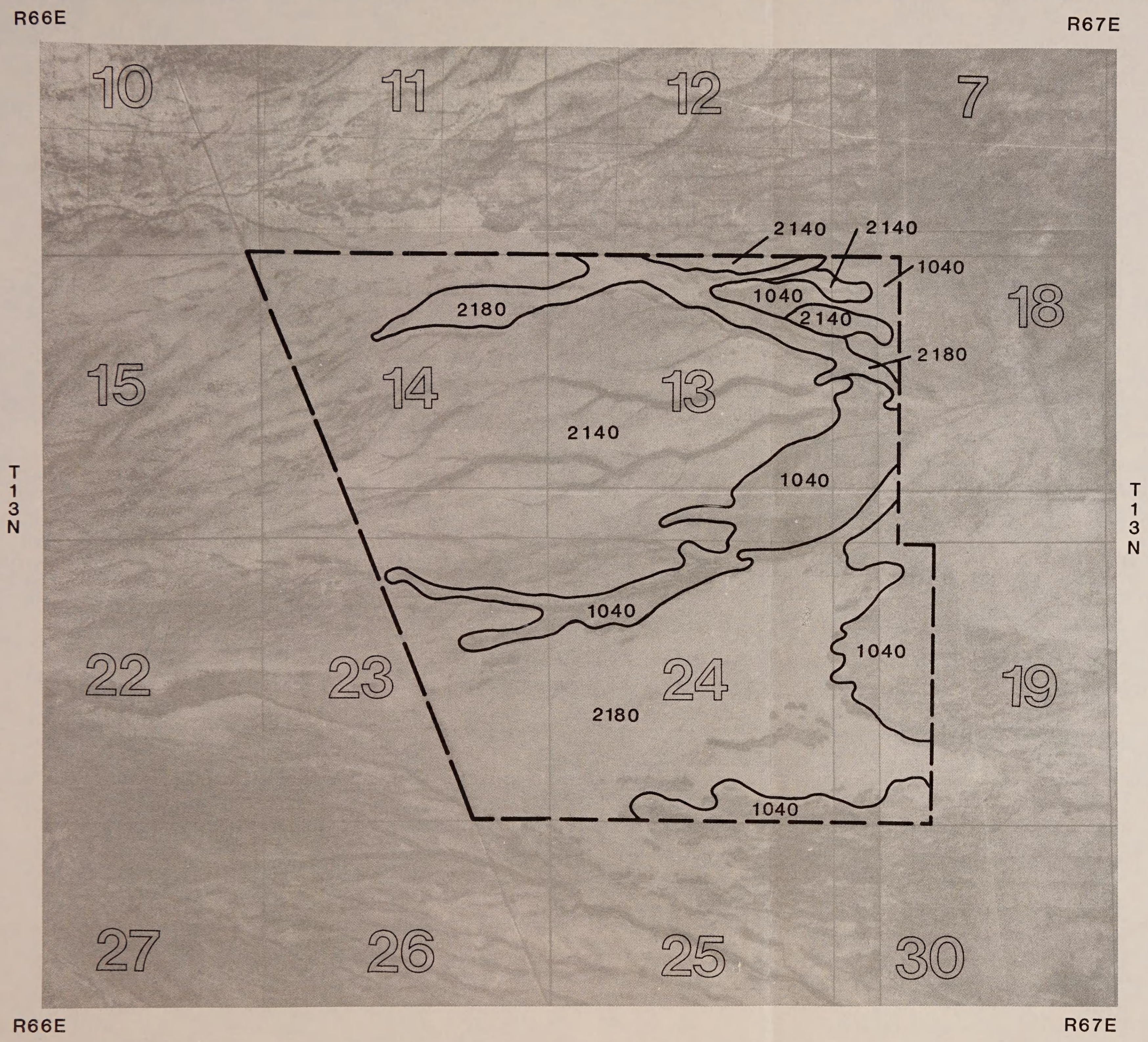
U.S. Bureau of Land Management

WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

SOILS AND ECOLOGICAL SITES
NORTH STEPTOE VALLEY SITE

FIGURE 4-2



LEGEND

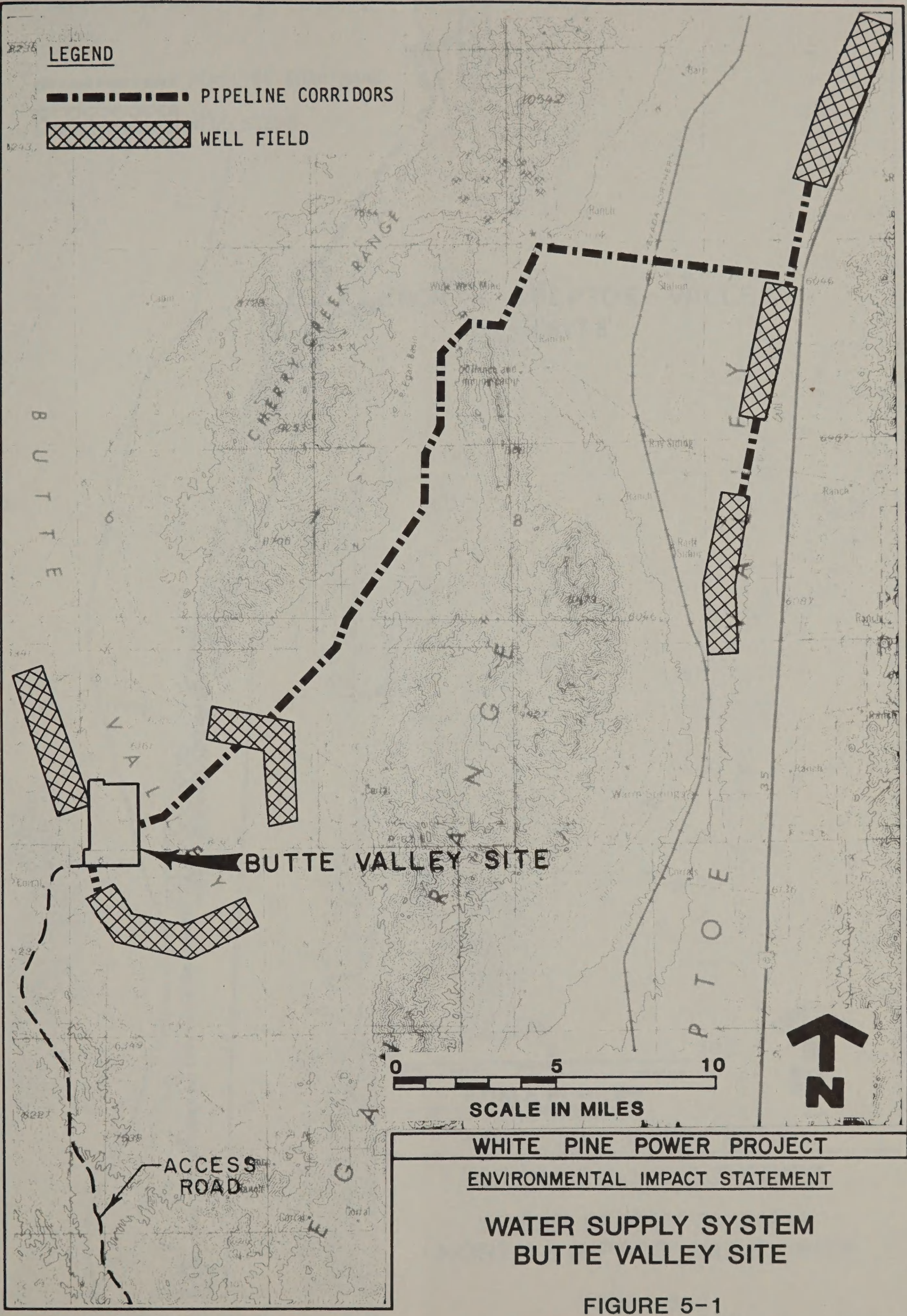
MAPPING UNIT NUMBER	MAJOR SOIL SERIES	MAJOR ECOLOGICAL SITES
1040	Sanpete	Loamy 8-10
2140	Ursine	Shallow Calcareous Loam 8-12
2180	Lusetti	Silty 8-10

Source:
U.S. Soil Conservation Service
U.S. Bureau of Land Management

WHITE PINE POWER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

SOILS AND ECOLOGICAL SITES
SPRING VALLEY SITE

FIGURE 4-3

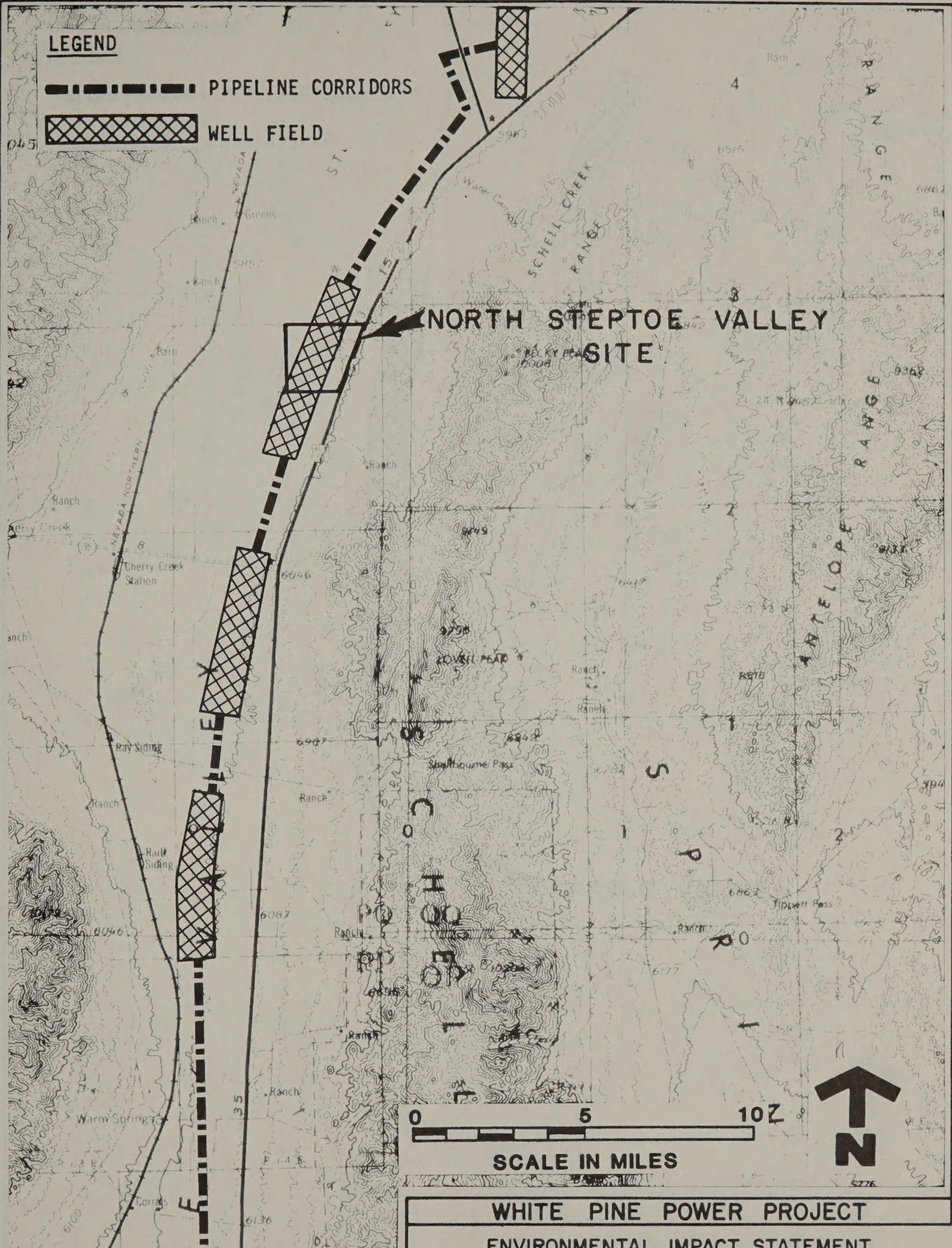


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

WATER SUPPLY SYSTEM
BUTTE VALLEY SITE

FIGURE 5-1

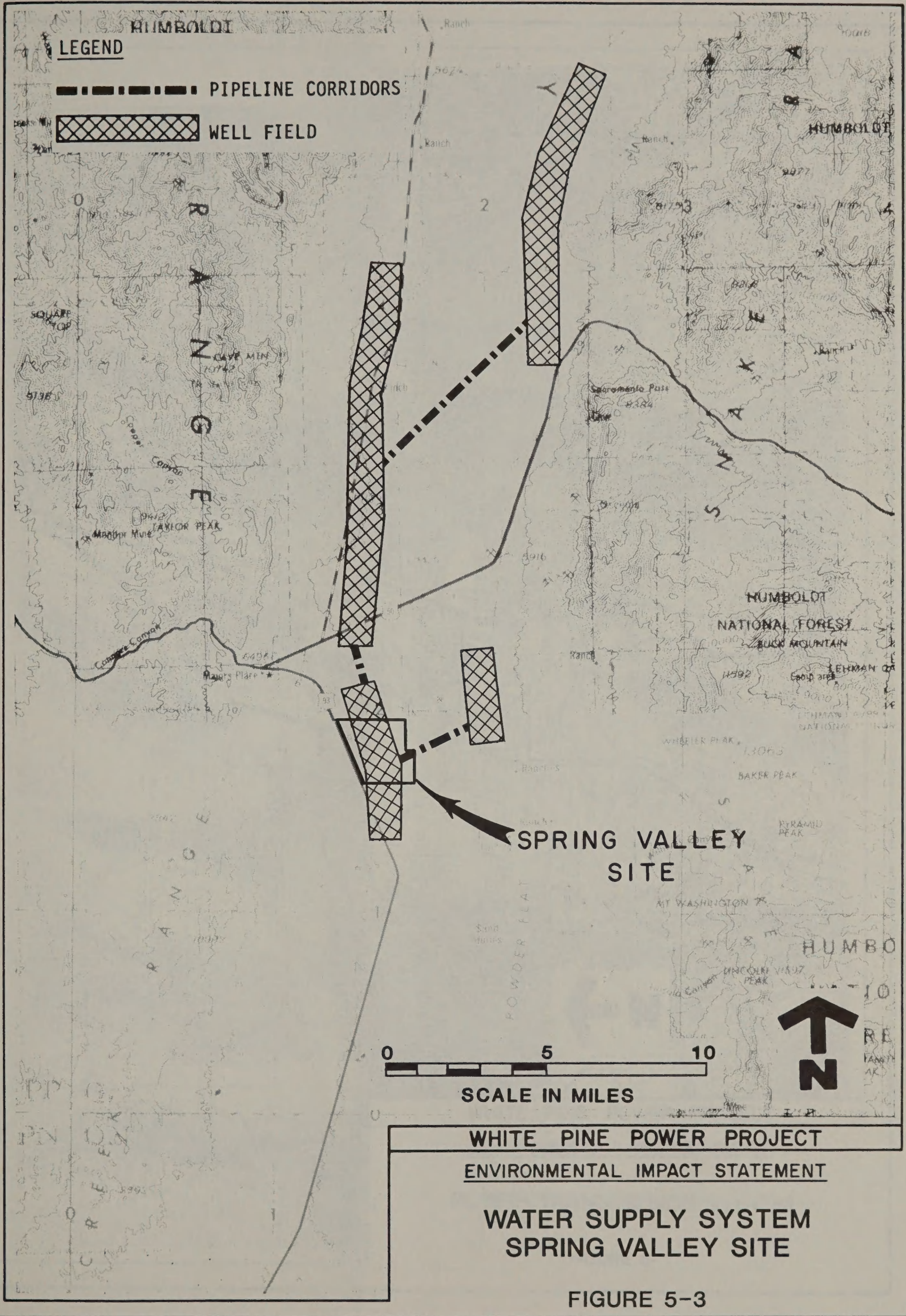


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

WATER SUPPLY SYSTEM
NORTH STEPTOE VALLEY SITE

FIGURE 5-2

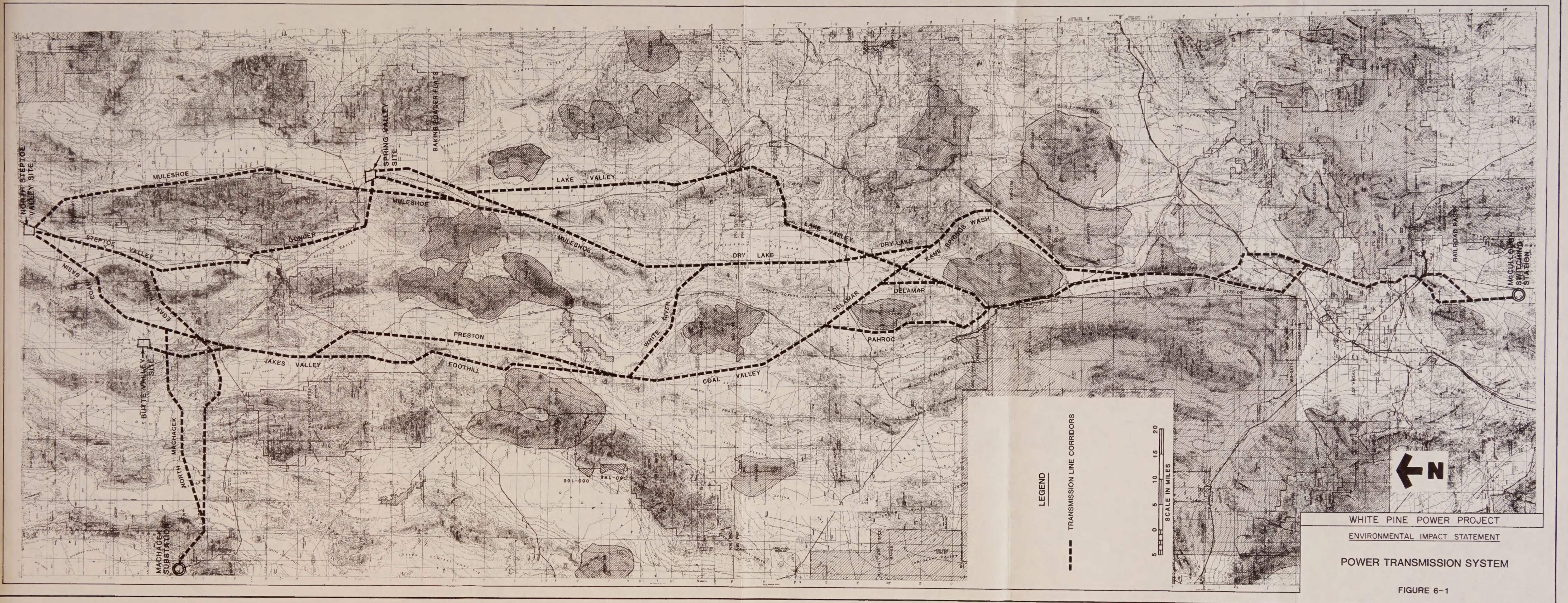


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

WATER SUPPLY SYSTEM
SPRING VALLEY SITE

FIGURE 5-3

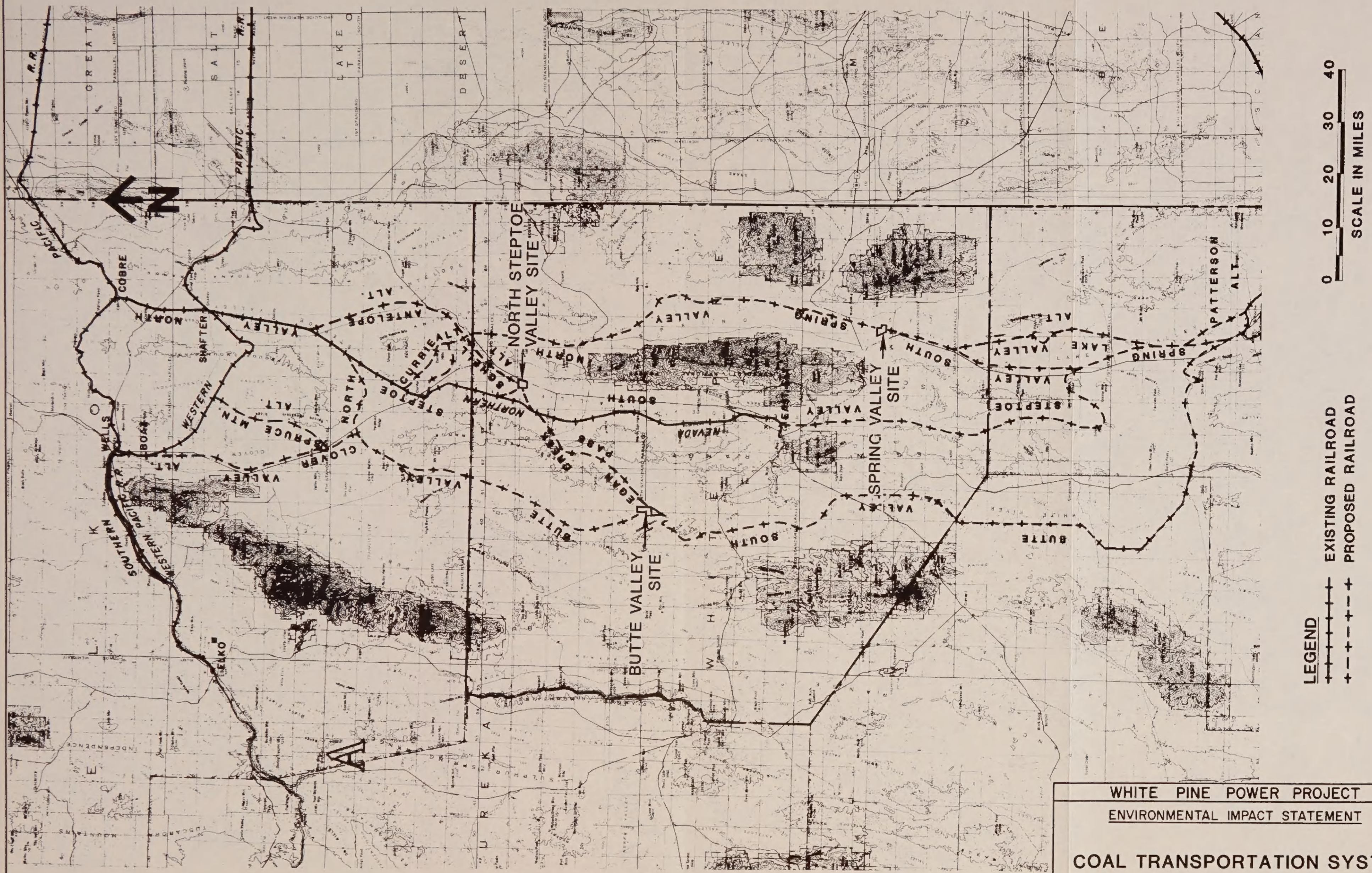


WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

POWER TRANSMISSION SYSTEM

FIGURE 6-1



WHITE PINE POWER PROJECT

ENVIRONMENTAL IMPACT STATEMENT

COAL TRANSPORTATION SYSTEM

FIGURE 7-1

APPENDICES

APPENDIX A

SOIL PROPERTIES

SOIL PROPERTIES

SOIL pH

A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as -

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

SALINITY

Class	Approximate % salt	Electrical conductivity (mmhos/cm)
nonsaline	0 - 0.15	0 - 4
slightly saline	0.15 - 3.5	4 - 8
moderately saline	0.35 - .65	8 - 15
strongly saline	above .65	above 15

SLOPE

The inclination of the land surface from horizontal. Percentage of slope is the vertical distance divided by horizontal then multiplied by 100.

PERMEABILITY

The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

WIND EROSION GROUPS

Soils are classed into wind erosion groups 1 through 8 with 1 being the most erodible and 8 the least.

WATER ERODIBILITY

Composite soil erodibility "K" factors are based on infiltration, permeability, water holding capacity, resistance to dispersion and other properties. Soil erodibility is determined from the percent sand, percent organic matter, soil structure and permeability. The factor is between 0 and 1.0 with the larger number being the most erodible.

HYDROLOGIC SOIL GROUPS

Refers to soils grouped according to their runoff-producing characteristics based on the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate

factors in predicting runoff. Group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, soil have a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material.

LAND CAPABILITY CLASS AND SUBCLASS, IRRIGATED

The land capability class (LCC) is indicated by Roman numerals II, III and IV and the subclass by letters e, w, s and c. The capabilities are for irrigated land use only.

Class II

Soils in Class II have some limitations that reduce the choice of plants or require moderate conservation practices.

Soils in Class II require careful soil management, including conservation practices, to prevent deterioration or to improve air and water relations when the soils are cultivated. The limitations are few and the practices are easy to apply.

Limitations of soils in Class II may include singly or in combination the effects of: 1) gentle slopes; 2) moderate susceptibility to wind or water erosion or moderate adverse effects of past erosion; 3) less than ideal soil depth; 4) somewhat unfavorable soil structure and workability; 5) slight to moderate salinity or sodium easily corrected but likely to recur; 6) occasional damaging overflow; 7) wetness correctable by drainage but existing permanently as a moderate

limitation; and 8) slight climatic limitations on soil use and management.

Class III

Soils in Class III have severe limitations that reduce the choice of plants or require special conservation practices, or both.

Soils in Class III have more restrictions than those in class II. The limitations may result from the effects of one or more of the following: 1) Moderately steep slopes; 2) high susceptibility to water or wind erosion or severe adverse effects of past erosion; 3) frequent overflow accompanied by some crop damage; 4) very slow permeability of the subsoil; 5) wetness or some continuing waterlogging after drainage; 6) shallow depths to bedrock, hardpan, fragipan, or claypan that limit the rooting zone and the water storage; 7) low moisture-holding capacity; 8) low fertility not easily corrected; 9) moderate salinity or sodium; or 10) moderate climatic limitations.

Class IV

Soils in Class IV have very severe limitations that restrict the choice of plants, require very careful management, or both. The restrictions in use for soils in Class IV are greater than those in Class III and the choice of plants is more limited.

Soils in Class IV may be well suite to only two or three of the common crops or the harvest produced may be low in relation to inputs over a long period of time. Use for cultivated crops is limited as a result of the effects of one or more permanent features such as: 1) steep slopes;

2) severe susceptibility to water or wind erosion; 3) severe effects of past erosion; 4) shallow soils; 5) low moisture-holding capacity; 6) frequent overflows accompanied by severe crop damage; 7) excessive wetness with continuing hazard of waterlogging after drainage; 8) severe salinity or sodium; or 9) moderately adverse climate.

Subclass (e) erosion is made up of soils where the susceptibility to erosion is the dominant problem or hazard in their use. Erosion susceptibility and past erosion damage are the major soil factors for placing soils in this subclass.

Subclass (w) excess water is made up of soils where excess water is the dominant hazard or limitation in their use. Poor soil drainage, wetness, high water table, and overflow are the criteria for determining which soils belong in this subclass.

Subclass (s) soil limitations within the rooting zone includes, as the name implies, soils that have such limitations.

Subclass (c) climatic limitation is made up of soils where the climate (temperature or lack of moisture) is the only major hazard or limitation in their use.

Limitations imposed by erosion, excess water, shallow soils, stones, low moisture-holding capacity, salinity, or sodium can be modified or partially overcome and take precedence over climate in determining subclasses. The dominant kind of limitation or hazard to the use of the land determines the assignment of capability units to the (e), (w), and (s) subclasses. Capability units that have no limitation other than climate are assigned to the (c) subclass.

APPENDIX B

PLANT SPECIES IN THE WPPP REGION

Plant Species in the WPPP Region

Family and Common Name	Scientific Name
Equisetaceae	
Horsetail	*Equisetum* spp.
Pinaceae	
Bristlecone pine	*Pinus longaeva* (*aristata*)
Douglas-fir	*Pseudotsuga menziesii*
Engelmann spruce	*Picea engelmannii*
Limber pine	*Pinus flexilus*
Ponderosa pine	*P. ponderosa*
Singleleaf pinyon	*P. monophylla*
Twoleaf pinyon (pinyon)	*P. edulis*
Whitebark pine	*P. albicaulis*
White fir	*Abies concolor*
Cupressaceae	
Rocky mountain juniper	*Juniperus scopulorum*
Swamp cedar	*J. scopulorum*
Utah juniper	*J. osteosperma*
Ephedraceae	
Green ephedra	*Ephedra viridis*
Joint-fir; Mormon tea	*Ephedra* spp.
Nevada ephedra	*E. nevadensis*
Typhacease Cattail	*Typha* spp.
Juncaginaceae	
Arrowgrass (shore podgrass)	*Triglochin maritima*
Gramineae (Poaceae)	
Alkali bluegrass	*Poa juncifolia*
Alkali cordgrass	*Spartina gracilis*
Alkali muhly	*Muhlenbergia asperifolia*
Alkali sacaton	*Sporobolus airoides*
Basin wildrye	*Elymus cinereus*

Family and Common Name	Scientific Name
Bearded bluebunch wheatgrass	*Agropyron spicatum spicatum*
Bluebunch wheatgrass	*A. spicatum*
Blue grama	*Bouteloua gracilis*
Bottlebrush squirreltail	*Sitanion hystrix*
Cheatgrass brome	*Bromus tectorum*
Creeping wildrye	*Elymus triticoides*
Crested wheatgrass	*Agropyron desertorum*
Fairway wheatgrass	*A. cristatum*
Galleta	*Hilaria jamesii*
Indian ricegrass	*Oryzopsis hymenoides*
Inland saltgrass	*Distichlis stricta*
Japanese chess	*Bromus japonicus*
Needle-and-thread	*Stipa comata*
Nuttall alkaligrass	*Puccinellia airoides*
Pine bluegrass	*Poa scabrella*
Russian wildrye	*Elymus junceus*
Sandberg bluegrass	*Poa secunda*
Sand dropseed	*Sporobolus cryptandrus*
Sixweeks fescue	*Vulpia octoflora*
Thurber needlegrass	*Stipa thurberiana*
Western wheatgrass	*Agropyron smithii*
Cyperaceae	
Bulrush	*Scirpus* spp.
Sedge	*Carex* spp.
Iridaceae	
Wild iris	*Iris missouriensis*
Juncaceae	
Baltic rush	*Juncus balticus*
Liliaceae	
Joshua-tree	*Yucca brevifolia*
Soaptree yucca	*Y. elata utahensis*
Salicaceae	
Aspen	*Populus tremuloides*
Polygonaceae	
Cushion eriogonum	*Erigonum ovalifolium*
Darrow buckwheat	*E. darrovii*

Family and Common Name	Scientific Name
Dock	*Rumex* spp.
Wild buckwheat	*Eriogonum* spp.
Wing wild buckwheat (eriogonum)	*E. alatum*
Chenopodiaceae	
Alkali seepweed	*Suaeda fruticosa*
Black greasewood	*Sarcobatus vermiculatus*
Fourwing saltbush	*Atriplex canescens*
Gardner saltbush	*A. gardneri*
Gray molly	*Kochia americana*
Halogeton	*Halogeton glomeratus*
Iodine bush	*Allenrolfea occidentalis*
Nuttall saltbush	*Atriplex nuttallii*
Russian thistle	*Salsola pestifer (kali)*
Seepweed	*Suaeda* spp.
Shadscale	*Atriplex confertifolia*
Spiny hopsage	*Grayia spinosa*
Winterfat	*Ceratoides lanata*
Caryophyllaceae	
Lobed-petal silene	*Silene scaposa* var. *latus*
Cruciferae (Brassicaceae)	
Bladderpod	*Lesquerella* spp.
Clasping leaf pepperweed	*Lepidium perfoliatum*
Douglas draba	*Draba douglasii*
Field penneycress	*Thlaspi arvense*
Oval leaf thelypody	*Thelypodium saggitatum* var. *ovalifolium*
Pepperweed	*Lepidium nanum*
Pinnate tansymustard	*Descurainia pinnata*
Prince's plume	*Stanleya pinnata*
Thelypody	*Thelypodium saggitatum*
Tumbling mustard	*Sisymbrium altissimum*
Wallflower	*Erysimum* spp.
Whitetop	*Cardaria draba*
Rosaceae	
Antelope bitterbrush	*Purshia tridentata*
Blackbrush	*Coleogyne ramossissium*
Curlleaf mountain mahogany	*Cercocarpus ledifolius*
Serviceberry	*Amelanchier alnifolia*

Family and Common Name	Scientific Name
Leguminosae (Fabiaceae)	
Broad pod freckled milkvetch	*Astragalus lentiginosus* var. *latus*
Milkvetch	*Astragalus* spp.
Silky lupine	*Lupinus sericeus*
Wild vetch	*Vicia* spp.
Zygophyllaceae	
Creosote bush	*Larrea tridentata*
Malvaceae	
Gooseberryleaf mallow	*Sphaeralcea grossulariaefolia*
Loasaceae	
Blazingstar mentzelia	*Mentzelia laevicaulis*
Cactaceae	
Clokey pincushion cactus	*Coryphantha vivipara* var. *rosea*
Great Basin fishhook cactus	*Sclerocactus pubispinus*
Prickly pear	*Opuntia* spp.
Eleagnaceae	
Silver buffaloberry	*Shepherdia argentea*
Umbelliferaea (Apiaceae)	
Basalt spring parsley	*Cymopterus basalticus*
Wyeth biscuitroot	*Lomatium ambiguum*
Polemoniaceae	
Collomia	*Collomia linearis*
Gilia	*Gilia (Ipomopsis)* spp.
Hoods phlox	*Phlox hoodii*
Phlox	*Phlox* spp.
Prickly phlox	*Leptodactylon pungens*
Boraginaceae	
Annual stickseed	*Lappula occidentalis*
Cryptantha	*Cryptantha longiflora*
Cryptantha	*C. osterhoutii*
Interrupted cryptantha	*C. interrupta*

Family and Common Name	Scientific Name
Boraginaceae	
Annual stickseed	Lappula occidentalis
Cryptantha	Cryptantha longiflora
Cryptantha	C. osterhoutii
Interrupted cryptantha	C. interrupta
Solanaceae	
Wolfberry	Lycium spp.
Scrophulariaceae	
Beard tongue	Penstemon speciosus
Beard tongue	P. eatonii
Desert Indian paintbrush	Castilleja chromosa
Indian paintbrush	Castilleja spp.
Monte Neva paintbrush	C. salsuginosa
Scarlet Indian paintbrush	C. coccinea
Compositae (Asteraceae)	
Alkali sagebrush	Artemisia longiloba
Aster	Machaeranthera grindeloiodes var. depressa
Basin big sagebrush	Artemisia tridentata tridentata
Big sagebrush	A. tridentata
Black sagebrush	A. nova
Brittlebush	Encelia spp.
Broom snakeweed	Gutierrezia (xanthocephalum) sarothrae
Bud sagebrush	Artemisia spinescens
Bursage	Ambrosia (Franseria) spp.
Canada thistle	Cirsium arvense
Douglas rabbitbrush	Chrysothamnus viscidiflorus
Fleabane	Erigeron pumilis
Goldenweed	Haplopappus acaulis
Goldenweed (Watson goldenweed)	H. watsonii
Greene rabbitbrush	Chrysothamnus greenei
Hooker's balsamroot	Balsamorhiza hookeri
Horsebrush	Tetradymia spp.
Littleleaf horsebrush	T. glabrata
Low rabbitbrush	Chrysothamnus viscidiflorus
Low sagebrush	Artemisia arbuscula
Nuttall horsebrush	Tetradymia nuttallii
Pygmy sagebrush	Artemisia pygmaea
Rabbitbrush	Chrysothamnus spp.
Rubber rabbitbrush	C. nauseosus

Family and Common Name	Scientific Name
Small rabbitbrush	C. stenophyllus
Spiny (cottonthorn) horsebrush	Tetradymia spinosa
Stiff sagebrush	Artemisia rigida
Tapertip hawksbeard	Crepis acuminata
Thistle	Cirsium spp.
White-leaf machaeranthera	Machaeranthera leucanthemifolia
Wyoming big sagebrush	Artemisia tridentata spp. wyomingensis

Source: Plummer, A. P., S. B. Monsen and R. Stevens. 1977. Intermountain Range Plant Names and Symbols. USDA, Forest Service, Gen. Tech. Rep. INT-38. Intermountain Forest and Range Experiment Sta., Ogden, UT.

APPENDIX C

TERRESTRIAL WILDLIFE SPECIES IN THE WPPP REGION

Terrestrial Wildlife Species in the WPPP Region

Common Name	Scientific Name	Habitat Preference[a]	Season of Use[b]
Mammals			
Merriam shrew	Sorex merriami	S	
Vagrant shrew	S. vagrans	W	
Little brown myotis	Myotis lucifugus	W	
Long-eared myotis	M. evotis	PJ	
California myotis	M. californicus	S, PJ	
Long-legged myotisp	M. volans	PJ, W	
Small-footed myotis	M. subulatus	S	
Spotted bat	Euderma maculata	S	
Silver-haired bat	Lasionycteris noctivagans	PJ	
Hoary bat	Lasiurus cinereus	S	
Western pipistrel	Pipistrellus hesperus	W	
Shorttail weasel	Mustela erminea	C, PJ	
Spotted skunk	Spilogale putorius	PJ	
Striped skunk	Mephitis mephitis	PJ, W	
Badger	Taxidea taxus	S	
Coyote	Canis latrans	S, PJ, C	
Kit fox	Vulpes macrotis	S	
Gray fox	Urocyon cinereoargenteus	PJ	
Mountain lion	Felis concolor	PJ	
Bobcat	Lynx rufus	PJ	
Yellowbelly marmot	Marmota flaviventris	C	
Townsend ground squirrel	Spermophilus townsendi	S	
Rock squirrel	S. variegatus	PJ	
Golden-mantled squirrel	S. lateralis	C	
Whitetail antelope squirrel	Ammospermophilus leucurus	S, PJ	
Least chipmunk	Eutamias minimus	S, PJ, C	
Yellow-pine chipmunk	E. amoenus	PJ	
Great Basin pocket mouse	Perognathus parvus	S	
Dark kangaroo mouse	Microdipodops megacephalus	S	
Ord kangaroo rat	Dipodomys ordi	S	
Chisel-toothed kangaroo rat	D. microps	S	
Northern pocket gopher	Thomomys talpoides	S, PJ, C	
Northern grasshopper mouse	Onychomys leucogaster	S	
Western harvest mouse	Reithrodontomys megalotis	W	
Canyon mouse	Peromyscus crinitus	PJ, C	
Deer mouse	P. maniculatus	S, PJ, C	
Pinyon mouse	P. truei	PJ	
Longtail vole	Microtus longicaudus	C	
Mountain vole	M. montanus	C	

Common Name	Scientific Name	Habitat Preference^a	Season of Use^b
Sagebrush vole	*Lagurus curtatus*	S	
Bushtail woodrat	*Neotoma cinerea*	C	
Desert woodrat	*N. lepida*	S	
Muskrat	*Ondatra zibethica*	W	
Porcupine	*Erethizon dorsatum*	S, PJ, C	
Blacktail jackrabbit	*Lepus californicus*	S	
Mountain cottontail	*Sylvilagus nuttalli*	PJ, C	
Desert cottontail	*S. auduboni*	S	
Pygmy rabbit	*S. idahoensis*	S	
Elk	*Cervus elaphus*	PJ, C	
Mule deer	*Odocoileus hemionus*	S, PJ, C	
Pronghorn	*Antilocapra americana*	S	
Bighorn sheep	*Ovis canadensis*	PJ	
Wild horse	*Equus cabullus*	S	
Birds			
Eared grebe	*Podiceps nigricollis*	W	S, B
Pied-billed grebe	*Podilymbus podiceps*	W	S, B
Double-crested cormorant	*Phalacrocorax auritus*	W	S, B
Great blue heron	*Ardea herodias*	W	R, B
Snowy egret	*Egretta thula*	W	S, B
American bittern	*Botaurus lentiginosus*	W	S, B
White-faced ibis	*Plegadis chihi*	W	S, B
Canada goose	*Branta canadensis*	W	R, B
Mallard	*Anas platyrhynchos*	W	R, B
Pintail	*A. acuta*	W	R, B
Green-winged teal	*A. crecca*	W	W, M
Cinnamon teal	*A. cyanoptera*	W	C, B
American widgeon	*A. americana*	W	R, B
Shoveler	*A. clypeata*	W	R, B
Ring-necked duck	*Aythya collaris*	W	W, M
Canvasback	*A. valisineria*	W	R, B
Greater scaup	*A. marila*	W	M
Lesser scaup	*A. affinis*	W	R, B
Bufflehead	*Bucephala albeola*	W	W, M
Ruddy duck	*Oxyura jamaicensis*	W	R, B
Turkey vulture	*Cathartes aura*	S, PJ	S, B
Cooper's hawk	*Accipiter cooperii*	PJ, C	S, B
Rough-legged hawk	*Buteo lagopus*	S	W, M
Ferruginous hawk	*B. regalis*	S, PJ	S, B
Red-tailed hawk	*B. jamaicensis*	S, PJ	R, B
Golden eagle	*Aquila chrysaetos*	S	R, B
Bald eagle	*Haliaeetus leucocephalus*	S, W	W, M
Marsh hawk	*Circus cyaneus*	S, W	R, B
Prairie falcon	*Falco mexicanus*	S,	R, B
American kestrel	*F. sparverius*	S, PJ	S, B
Blue grouse	*Dendragapus obscurus*	C	R, B

Common Name	Scientific Name	Habitat Preference[a]	Season of Use[b]
Sage grouse	*Centrocercus urophasianus*	S	R, B
Gambel's quail	*Lophortyx gambelii*	S	R, B
Scaled quail	*Callipepla squamata*	S	R, B
Chukar	*Alectoris chukar*	S, PJ	R, B
Sandhill crane	*Grus canadensis*	W, S	S, B
Virginia rail	*Rallus limicola*	W	S, B
Sora	*Porzana carolina*	W	S, B
American coot	*Fulica americana*	W	R, B
Killdeer	*Charadrius vociferus*	W	S, B
Common snipe	*Capella gallinago*	W	R, B
Long-billed curlew	*Numenius americannus*	W	S, B
Spotted sandpiper	*Actitis macularia*	W	S, B
Solitary sandpiper	*Tringa solitaria*	W	M
Willet	*Catoptrophorus semipalmatus*	W	S, B
Greater yellowlegs	*Totanus melanoleucus*	W	S, B
Least sandpiper	*Erolia minutilla*	W	M
Western sandpiper	*Calidris mauri*	W	M
Long-billed dowitcher	*Limnodromus scolopaceus*	W	M
American avocet	*Recurvirostra americana*	W	S, B
Black-necked stilt	*Himantopus mexicanus*	W	S, B
Wilson's phalarope	*Steganopus tricolor*	W	S, B
Northern phalarope	*Lobipes lobatus*	W	M
California gull	*Larus californicus*	W	S
Ring-billed gull	*L. delawarensis*	W	S
Forster's tern	*Sterna forsteri*	W	S
Black tern	*Chlidonias niger*	W	S
Rock dove	*Columba livia*	S, PJ	R, B
Mourning dove	*Zenaida macroura*	S	S, B
Great horned owl	*Bubo virginianus*	S, PJ, C	R, B
Long-eared owl	*Asio otus*	PJ, C	S, B
Poor-will	*Phalaenoptilus nuttallii*	S, PJ	S, B
Common nighthawk	*Chordeiles minor*	S, PJ, C	S, B
Lesser nighthawk	*C. acutipennis*	S	S
Broad-tailed hummingbird	*Selasphorus platycercus*	C	C, B
Rufous hummingbird	*S. rufus*	PJ, C	M
Calliope hummingbird	*Stellula calliope*	C	M
Belted kingfisher	*Megaceryle alcyon*	W	R, B
Common flicker	*Colaptes auratus*	PJ, C	R, B
Lewis woodpecker	*Melanerpes lewis*	C	S, B
Hairy woodpecker	*Picoides villosus*	PJ, C	R, B
Yellow-bellied sapsucker	*Sphyrapicus varius*	PJ, C	R, B
Western kingbird	*Tyrannus verticalis*	S, PJ	S, B
Say's phoebe	*Sayornis saya*	S	S, B
Willow flycatcher	*Empidonax traillii*	S, W	S, B
Hammond's flycatcher	*E. hammondii*	C	S, B
Dusky flycatcher	*E. oberholseri*	PJ	S, B
Gray flycatcher	*E. wrightii*	S, PJ	S, B

Common Name	Scientific Name	Habitat Preference[a]	Season of Use[b]
Western flycatcher	*E. difficilis*	C	S, B
Olive-sided flycatcher	*Nuttallornis borealis*	PJ, C	S, B
Horned lark	*Eremophila alpestris*	S	R, B
Violet-green swallow	*Tachycineta thalassina*	S, PJ	S, B
Tree swallow	*Iridoprocne bicolor*	PJ, C	S, B
Bank swallow	*Riparia riparia*	W	S, B
Rough-winged swallow	*Stelgidopteryx ruficollis*	W	S, B
Barn swallow	*Hirundo rustica*	S, PJ	S, B
Cliff swallow	*Petrochelidon pyrrhonota*	S, PJ	S, B
Scrub jay	*Aphelocoma coerulescens*	PJ	R, B
Stellar's jay	*Cyanocitta stelleri*	PJ	S
Black-billed magpie	*Pica pica*	S, PJ	R, B
Common raven	*Corvus corax*	S, PJ	R, B
Common crow	*C. brachyrhynchos*	S, PJ	R, B
Pinon jay	*Gymnorhinus cyanocephala*	PJ	R, B
Clark's nutcracker	*Nucifraga columbiana*	C	R, B
Mountain chickadee	*Parus gambeli*	C	R, B
Plain titmouse	*P. inornatus*	PJ	R, B
Bushtit	*Psaltriparus minimus*	PJ	R, B
White-breasted nuthatch	*Sitta carolinensis*	PJ	R, B
Red-breasted nuthatch	*S. canadensis*	PJ, C	R, B
Pygmy nuthatch	*S. pygmaea*	PJ, C	R, B
Brown creeper	*Certhia familiaris*	PJ, C	R, B
Dipper	*Cinclus mexicanus*	W, C	R, B
House wren	*Troglodytes aedon*	PJ	S, B
Bewick's wren	*Thryomanes bewickii*	PJ	S, B
Long-billed marsh wren	*Cistothorus palustris*	W	R, B
Rock wren	*Salpinctes obsoletus*	S, PJ, C	S, B
Mockingbird	*Mimus polyglottos*	S	R, B
Sage thrasher	*Oreoscoptes montanus*	S	S, B
American robin	*Turdus migratorius*	PJ, C	R, B
Mountain bluebird	*Sialia currucoides*	PJ, C	R, B
Townsend's solitaire	*Myadestes townsendi*	C, PJ	R, B
Ruby-crowned kinglet	*Regulus calendula*	C	S, B
Water pipit	*Anthus spinoletta*	C	S, B
Cedar waxwing	*Bombycilla cedrorum*	S, PJ	S, M
Loggerhead shrike	*Lanius ludovicianus*	S	R, B
Starling	*Sturnus vulgaris*	S, PJ	R, B
Solitary vireo	*Vireo solitarius*	PJ	S, B
Warbling vireo	*V. gilvus*	PJ	S, B
Yellow warbler	*Dendroica petechia*	PJ, W	S, B
Yellow-rumped warbler	*D. coronata*	PJ, C	S, B
Black-throated gray warbler	*D. nigrescens*	PJ	S, B
MacGillivray's warbler	*Oporornis tolmiei*	PJ, C	S, B
Common yellowthroat	*Geothlypis trichas*	W	S, B
Wilson's warbler	*Wilsonia pusilla*	PJ, W	S, B

Common Name	Scientific Name	Habitat Preference[a]	Season of Use[b]
Western meadowlark	Sturnella neglecta	S	S, B
Yellow-headed blackbird	Xanthocephalus xanthocephalus	W	S, B
Red-winged blackbird	Agelaius phoeniceus	W	S, B
Northern oriole	Icterus galbula	PJ, W	S, B
Brewer's blackbird	Euphagus cyanocephalus	S, W	S, B
Brown-headed cowbird	Molothrus ater	S, W	S, B
Western tanager	Piranga ludoviciana	C	S, B
Black-headed grosbeak	Pheucticus melanocephalus	PJ	S, B
Lazuli bunting	Passerina amoena	S	S, B
Evening grosbeak	Hesperiphona vespertina	C	S, B
Purple finch	Carpodacus purpureus	PJ	M
Cassin's finch	C. cassinii	PJ, C	S, B
House finch	C. mexicanus	S	S, B
Gray-crowned rosy finch	Leucosticte tephrocotis	S, PJ	W, M
Pine siskin	Carduelis pinus	C, PJ	S, B
American goldfinch	C. tristis	W	S, B
Lesser goldfinch	C. psaltria	PJ	S, B
Red crossbill	Loxia curvirostra	C	S, B
Green-tailed towhee	Pipilo chlorurus	S	S, B
Rufous-sided towhee	P. erythrophthalmus	PJ	S, B
Savannah sparrow	Passerculus sandwichensis	S	S, B
Vesper sparrow	Pooecetes gramineus	S	S, B
Lark sparrow	Chondestes grammacus	PJ	S, B
Black-throated sparrow	Amphispiza bilineata	S	S, B
Sage sparrow	A. belli	S	S, B
Dark-eyed junco	Junco hyemalis	C	R, B
Gray-headed junco	J. caniceps	C	R, B
Chipping sparrow	Spizella passerina	PJ	S, B
Brewer's sparrow	S. breweri	S	S, B
White-crowned sparrow	Zonotrichia leucophrys	S, PH	R, B
Fox sparrow	Passerella iliaca	PJ	S, B
Song sparrow	Melospiza melodia	PJ	S, B
Amphibians			
Great Basin spadefoot	Scaphiopus intermontanus		
Western toad	Bufo boreas		
Pacific treefrog	Hyla regilla		
Leopard frog	Rana pipiens		
Reptiles			
Desert tortoise	Gopherus agassizi		
Zebra-tailed lizard	Callisaurus draconoides		
Leopard lizard	Crotaphytus wislizeni		

Common Name	Scientific Name	Habitat Preference[a]	Season of Use[b]
Collared lizard	*C. collaris*		
Desert spiny lizard	*Sceloporus magister*		
Western fence lizard	*S. occidentalis*		
Sagebrush lizard	*S. graciosus*		
Side-blotched lizard	*Uta stansburiana*		
Short-horned lizard	*Phrynosoma douglassi*		
Desert horned lizard	*P. platyrhinos*		
Gila monster	*Heloderma suspectum*		
Western skink	*Eumeces skiltonianus*		
Western whiptail	*Cnemidophorus tigris*		
Rubber boa	*Charina bottae*		
Striped whipsnake	*Masticophis taeniatus*		
Coachwhip	*M. flagellum*		
Racer	*Coluber constrictor*		
Western patch-nosed snake	*Salvadora hexalepis*		
Gopher snake	*Pituophis melanoleucus*		
Common kingsnake	*Lampropeltis getulus*		
Long-nosed snake	*Rhinocheilus lecontei*		
Western garter snake	*Thamnophis elegans*		
Western ground snake	*Sonora semiannulata*		
Night snake	*Hypsiglena torquata*		
Western rattlesnake	*Crotalus viridis*		
Sidewinder	*C. cerastes*		
Speckled rattlesnake	*C. mitchelli*		

---

[a] Key to Habitat Preference

S - Shrub-steppe
W - Wetland
PJ - Pinyon-Juniper
C - Coniferous Forest

[b] Key to Season of Use
R - Resident
S - Summer
W - Winter
M - Migrant
B - Breeds in area

Sources: Burt, W.H. and R.P. Grossenheider, 1964. A field guide to the mammals. Houghton Mifflin Company, Boston, Massachusetts.

U.S. Department of the Interior, 1971. Mammals of the Elko BLM District. U.S. Bureau of Land Management, Elko, Nevada.

Stebbins, R.C., 1966. A field guide to western reptiles and amphibians. Houghton Mifflin Company; Boston, Massachusetts.

Nevada Department of Wildlife (no date). Checklist of birds of northeastern Nevada. Nevada Department of Wildlife, Reno, Nevada.

Peterson, R.T.., 1969. A field guide to western birds. Houghton-Mifflin Company, Boston, Massachusetts.

U.S. Department of the Interior, 1979. Birds of the Ely District, U.S. Bureau of Land Management, Ely, Nevada.

U.S. Department of the Interior (no date). Birds of the Elko BLM District. Bureau of Land Management, Elko, Nevada.

APPENDIX D

AQUATIC SPECIES IN THE WPPP REGION

Aquatic Species in the WPPP Region

Common Name	Scientific Name
Bonneville cutthroat trout	*Salmo clarki utah*
Cutthroat trout	*Salmo clarki*
Rainbow trout	*Salmo gairdneri*
Brown trout	*Salmo trutta*
Brook trout	*Salvelinus fontinalis*
Common carp	*Cyprinus carpio*
Independence Valley tui chub	*Gila bicolor isolata*
Northern pike	*Esox lucius*
White River spinedace	*Lepidomeda albivallis*
Big Springs spinedace	*Lepidomeda mollispinis pratensis*
Clover Valley speckled dace	*Rhinichthys osculus oligoporus*
Independence Valley speckled dace	*Rhinichthys osculus lethoporus*
Meadow Valley Wash speckled dace	*Rhinichthys osculus spp.*
White River speckled dace	*Rhinichthys osculus velifer*
Relict dace	*Relictus solitarius*
White River desert sucker	*Catostomus clarki intermedius*
White River springfish	*Crenichthys baileyi baileyi*
Preston White River springfish	*Crenichthys baileyi albivallis*
Pahrump killifish	*Empetrichthys latos*